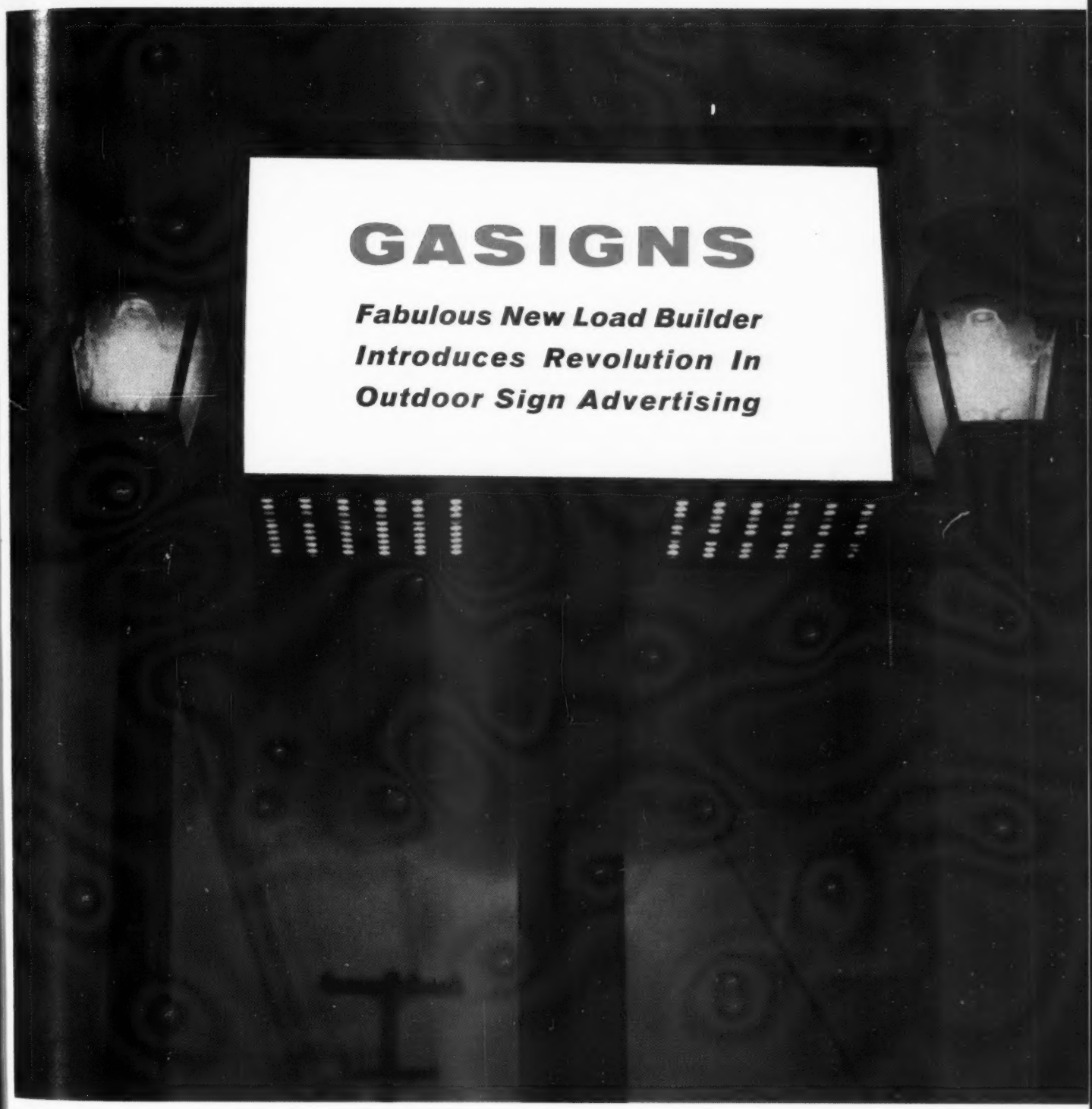

AMERICAN
Gas Journal
THE MAGAZINE OF GAS DISTRIBUTION

How To Squeeze Pipe

Management Meets Housewife

New Ideas in Regulation

APRIL 1961

YOUR EMPLOYEES

SAFETY

YOUR CUSTOMERS

MUELLER® NO-BLO® METHODS permit you to drill a main or line, under pressure ■ ■ ■ without "blowing" gas into the atmosphere ■ ■ ■ without interrupting service to your customers! ■ Rugged, "service-proven" Mueller Products and No-Blo Methods can provide these benefits for *your* employees and customers. Ask the Mueller Representative in your area to explain the uses and applications of the complete line of Mueller No-Blo Products and Equipment.

Safety—another basic benefit from . . .

MUELLER CO. since 1857 SERVING the Water and Gas Industries QUALITY 5579

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited, Sarnia, Ontario

PILOT LIGHTS

Lift That Load

Mantles: Magic Mites that light up the new gasign are also lighting the way for gas utilities to capture part of the electric industry's rich lighting load as well as build their own year-round gas volume. Three advantages are helping the new gas appliance introduce a revolution in outdoor sign advertising:

- lower first cost than competitive electric signs of same or similar design,
- lower maintenance costs, and
- lower operating costs.

Details on the development of the Gasign, its burner arrangement, the revolutionary photocell control that utilizes thermocouples to generate its own electricity and automatically turn sign down in daylight and to full brilliance at night; the special high-tempered glass material finally adopted for side panels, and the silk-screening process for individualized messages are described on page 36.

Pinch for Profit?

For most utilities, pipe means money and the pocketbook — and like most utilities, Southern Counties Gas Company never found a pinch on the pocketbook pleasant. That is, until recent developments utilizing pipe pinching uncovered at least one way to squeeze a few more miles out of the dollar. Using a unique hydraulic jack-type operated pipe squeezer and reopener, the utility is able to save mucho time and money . . . article on page 32 covers in detail the use of the pipe squeezer, advantages, and economics.

Management Asks Questions

Top-management-turned-interviewer took up the task of questioning El Paso, Texas, housewives recently to find out what they thought of Southern Union Gas Co. Called the first public opinion survey ever conducted by a gas company using its top management to do the actual field interviewing, the survey paid off in several ways. Want to know more? Turn to page 26.

American Gas Journal

THE MAGAZINE OF GAS DISTRIBUTION

VOLUME 188 — APRIL 1961 — NUMBER 4

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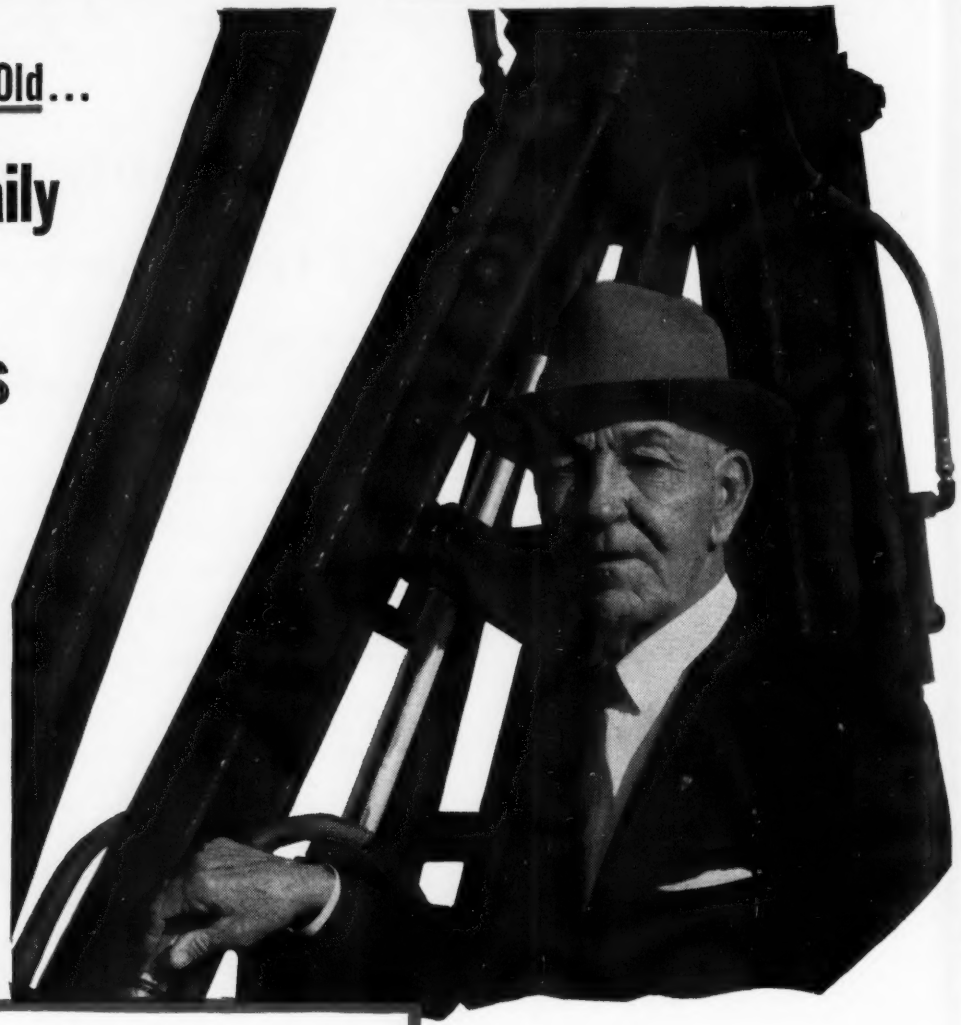
Old Shermans Sell New Shermans

The Old...

"6 years of daily digging... Several years of good service left"

Mr. Robert Thompson,
General Supt.
Laurel Land Memorial Park
Dallas, Texas



And the New...

SHERMAN BOBCAT DIGGER

Compact, maneuverable 8′ or 10′ digger for light budgets, tight spots–cemeteries, inside work–or where light weight is necessary.

SHERMAN PANTHER DIGGER

Big and fast, with typical Sherman dependability... 12′ digging depth, 188° swing, exclusive filter gauge, much more for high production, low maintenance.

SHERMAN MAJOR DIGGER

Here's a perfect pair – match Sherman's durability, "dig-ability" with Fordson's rugged diesel economy. 12′ digging depth.

ALSO...

12 speeds instead of 4—For more power, more economy, equip your 4-speed Ford tractor with the Sherman combination over-under transmission to match exactly power and speed to every job. Or, for fast shuttling, install a time-saving Sherman reversing transmission.

Why not find out what Sherman can do for you? See your Ford dealer...Check the Yellow Pages or write to Allied Equipment, Ford Motor Company, 2500 East Maple Rd., Birmingham, Mich.

"We've used this Sherman almost every day for six years to dig in muck, clay, shale and rock. Maintenance and downtime costs have been small—in fact, we figure that Sherman diggers have reduced our operating costs more than 50%. Now that we're expanding, we're adding a new Sherman digger. Over the years we've decided that Sherman gives us the fast digging and consistent daily service we need for smooth operation of our business. We expect even greater productivity and dependability from our new Sherman."

SHERMAN

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AUXILIARY TRANSMISSIONS

American Gas Journal
1859 - 1961
102 Years of Service

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M C F

NEWS HILITES OF THE INDUSTRY

Use of liquefied natural gas (LNG) for peak shaving in New England is being studied by a group of 40 New England gas utilities. The utilities, which formed the New England Gas Pooling Group last year, have received a feasibility study from a consulting engineering firm that recommends LNG storage. A spokesman for the pooling group noted that the study was "merely one of feasibility and from now on the actual hard work begins." Most economic form of storage appears to be an underground refrigerated storage tank on which the American Gas Association is conducting research. *(Data on such storage appeared in the November 1960 issue of American Gas Journal, "Non-Conventional Storage of Natural Gas," page 20.)* The New England utilities could purchase off-peak gas in the summer, liquefy and store it, and use it to meet peak winter demands, and do it far more economically than is now being done by meeting peaks with other forms of peak-shave gas — such as propane-air gas or manufactured gas.

Old I.P. rate cases never die. The state of Wisconsin and its public service commission, Long Island Lighting Company, Philadelphia Electric Company, United Gas Improvement Company, and the "people" of California and the California PUC have all petitioned the FPC for a review of the commission's Phillips rate opinion issued in September, 1960. The FPC ruled in the Phillips opinion that there are too many insufficiencies in the utility rate base method to use it as the sole means of fixing independent natural gas producer rates. The Phillips case, presented on a cost basis, was terminated.

Underground storage in Prince Georges county of Maryland is up for consideration again in the Maryland general assembly. Washington Gas Light Company, which plans to use a dome structure in the southern part of the county, needs condemnation powers to develop the storage area because some land owners are "afraid" of gas storage. Company officials hope that a soft-sell campaign last December may have softened opposition to a bill granting condemnation powers. The bill has been under consideration since 1954. WGL's soft-sell project included taking some officials and influential residents of the area to operating storage projects elsewhere in the nation to demonstrate the safety and feasibility of underground gas storage.

Exploration for new natural gas reserves is lagging, despite soaring demand. Producers aren't making an all-out effort to find new supplies. The reasons revolve mainly around the confusing federal attempts to fix prices and otherwise regulate a "high risk" industry . . . leaving many independent producers frustrated, discouraged, and even angry. The impact on the gas industry can be seen by comparing 1945 reserve figures — which equaled a 34-year supply — to those of today, when reserves are equal to about a 21-year supply. Added to this is the fact that more and more gas is being sold in intrastate commerce for industrial uses. Producers are not happy, either, with FPC's area pricing . . . many see it as a long-term price freeze. Gas producers point out that they are the only fuel suppliers that must agree to long-term delivery contracts . . . and that regulation does not guarantee any adjustments in prices as the economy grows, costs of production increase, and inflation devalues the dollar.

No more waiting lists for gas space customers in Chicago. Peoples Gas Light and Coke Company is now offering space heating service to all applicants who request it. Only applicants on the waiting list, established in 1946, are those who didn't take advantage of previous space heating offers but who want their applications kept on file. New gas space heat customers will still have to get written authorization from the company, though.

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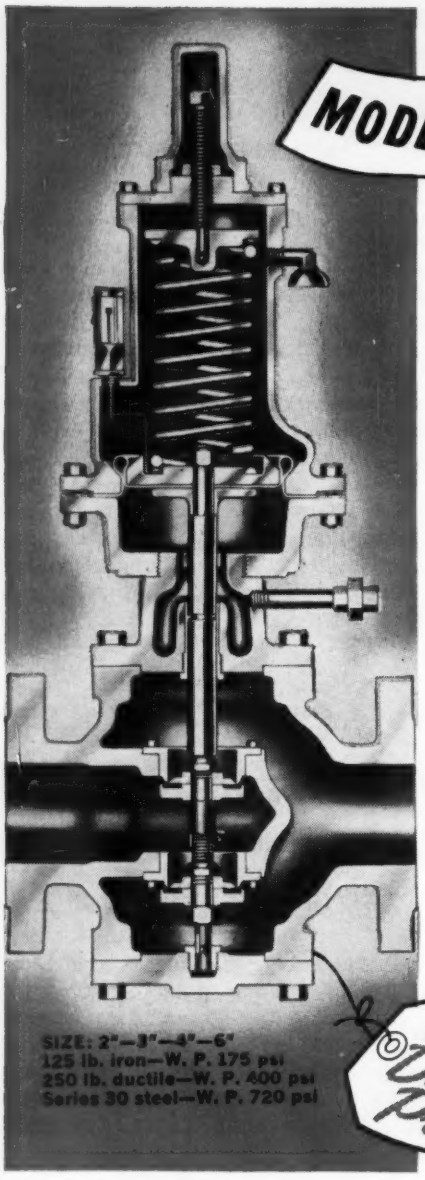
CHAPLIN-FULTON

MODELS

441 461-57S

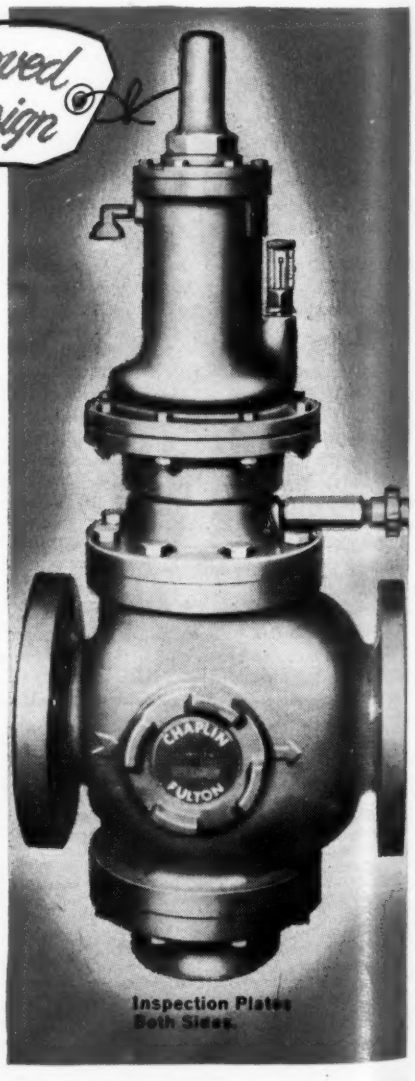
Gas Regulator



Model 57-S, for pounds-to-pounds service, operates on a new principle which maintains accurate control throughout full valve travel. The *patented* diaphragm action compensates for the "fall-off" in conventional spring regulators, which greatly limits their capacity to allowable droop. You can reduce costs greatly by installing a 57-S, one or even two sizes smaller than previously, to deliver the same volume. Usable Capacity = 100% of potential capacity. Controlled pressures—3 to 75 psi—with *one* assembly.

Advanced Diaphragm Principle

Improved Body Design



Also, new improved body design—either 441 or 461—with enlarged flow areas and standard face-to-face dimensions for easy replacement. Available in iron, nodular ductile or electric steel. And an extra value—inspection plates on *both* sides, O-ring sealed —for quick removal and ready inspection. A valve travel indicator to check position and estimate flow, pressure and water tight.

New principle—new design—new versatility—greater economy.

ACCURATE CF MFG CO DEPENDABLE

Chaplin-Fulton

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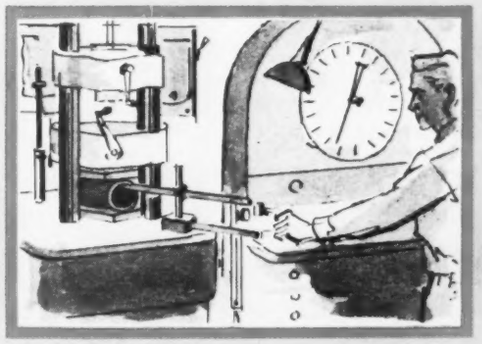
Pittsburgh 25, Pennsylvania

61-571

DUCTILE DIGEST

CHICAGO'S SUCCESS STORY! Peoples Gas Light and Coke Company of Chicago... the first and foremost user of ductile iron pipe for gas service... since 1954 has installed more than 100 miles of ductile iron pipe, most of which is AMERICAN DUCTILE IRON. Distributing gas at various pressures, this pipe is withstanding extreme frost conditions, unstable ground stresses and the impact of ever-increasing heavy traffic. To date, Peoples Gas reports: "No breaks!"

EASILY ASSEMBLED, BOTTLE-TIGHT JOINT! The AMERICAN Double-X joint, developed over 30 years ago, is accepted as the standard type of joint for ductile iron gas mains. Millions of feet of pipe equipped with this joint are now rendering dependable, trouble-free service. Its ease and speed of assembly, its ability to be installed in all types of weather, and its proven, leak-free performance in service... have earned the approval of utilities and contractors across the nation.



A CRUSHING LOAD... Proving that AMERICAN DUCTILE IRON® pipe has added safety factors to withstand rugged treatment in transit, in installation, in service. In laboratory tests on a sample, 12" long, cut from AMERICAN DUCTILE IRON® pipe, a 6" ring, .35" thick, withstood a crushing load of 24,850 pounds and a 20" ring, .57" thick, withstood a load of 19,180 pounds.

Write for free illustrated catalog.

AMERICAN CAST IRON PIPE COMPANY
BIRMINGHAM ALABAMA

Continued from page 3.

MCF NEWS HILITES OF THE INDUSTRY

Group of leading gas utilities and Minnesota Mining & Manufacturing Company have put their heads together in an 18-month cooperative development program aimed at design of pre-production prototypes of a thermoelectric furnace generator. Participating utilities are: Michigan Consolidated Gas Co.; Brooklyn Union Gas Co.; Consolidated Natural Gas System; Southern California Gas Co.-Southern Counties Gas Co.; Peoples Gas Light and Coke Co.; Laclede Gas Co.; Minneapolis Gas Co.; Northern Illinois Gas Co.; Lone Star Gas Co., and the Columbia Gas System. The 3M Company's 12 years experience with thermoelectric materials and devices is expected to be a major factor in the program. Companies hope to develop a thermoelectric generator that will convert heat from furnace combustion chamber directly into electricity thereby supplying all the power required for operating blower or pump motors and making the furnace completely independent of any outside power source.

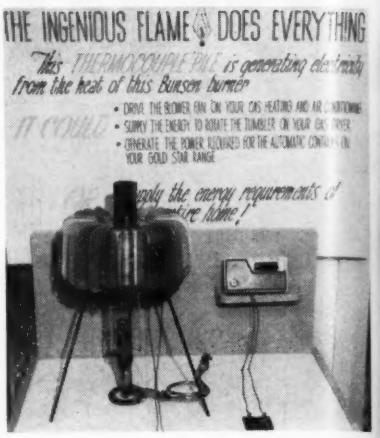
World's first refrigerated Liquefied Petroleum Gas tanker designed by Conch International Methane Limited, is being built for Bridgestone Liquefied Petroleum Gas Co. Ltd., a Japanese firm, by Mitsubishi Nippon Heavy Industries (Yokohama) Ltd., one of Japan's leading shipyards. Ship will have a capacity of 180,000 barrels, equivalent to approximately 17,000 tons of refrigerated LP-gas at approximately minus 40 degrees Fahrenheit. Conch also designed the "Methane Pioneer," world's first liquid methane carrier; the Bridgestone tanker is said to incorporate much of the "know-how" and experience gained from the "Methane Pioneer" voyages. The Bridgestone tanker is scheduled for completion in early 1962, and will be first large-scale commercial ship to carry LP-gas at essentially atmospheric pressure.

Southern Counties-Southern California Gas companies have launched two far-reaching advertising campaigns aimed at assuring the public gas looms ever more important in Southern California's future energy picture. Backed by the heaviest advertising expenditures in the history of the two affiliated companies, the concurrent campaigns will carry the themes of "Balanced Power Homes," and "The Future Belongs to Gas." First in the "Future" series describes briefly 4 devices that turn gas directly into electricity without moving parts and points out that "laboratories of 50 leading industrial firms and universities are developing new easy ways to turn gas directly into electricity, right in your home . . . " However, the copy notes, "the familiar blue flame will continue to supply heat for heating and cooling your home, cooking, water heating, refrigeration and clothes drying. Nothing is so fast or economical as the gas flame for these big jobs."

Blue Star Home Builder of the Year is Emil A. Hanslin, builder-realtor of Lynnfield, Massachusetts. He was selected for the annual A.G.A. award, which was presented to him during the National Association of Home Builders convention in Chicago, because of the advanced methods of home construction and application of new materials and equipment in his all-gas home in Lynnfield. The unusual home was featured in October 1960 *Good Housekeeping Magazine* and in two articles in *House & Home Magazine*.

Connecticut Light and Power Company's plan to merge Housatonic Public Service Company on the basis of an exchange of 1.4 shares of CL&P common stock for one share of Housatonic common is still in process. "Because any merger must be a tax-free transaction to the shareholders of the merging companies, a tax ruling has been requested from the Internal Revenue Service." And, pending favorable ruling, the merger will be voted upon at the annual meeting of shareholders. Housatonic presently serves approximately 10,769 customers in Ansonia, Derby, Monroe, and Shelton, Connecticut.

Development of thermo-ionic, thermoelectric and fuel cell devices for application in new gas appliances has become a 3-pronged effort of the gas and gas appliance industries, T. Lee Robey, director of research for the American Gas Association, told gas men attending a joint meeting of the A.G.A. and Pacific Coast Gas Association held recently. "AGA expects to test a prototype thermo-ionic converter now being built by Thermo Electron Engineering Corp. this month (March) for possible application to gas appliances." A.G.A. is also experimenting with thermoelectric devices in which two different metals are heated to produce heat energy for application to gas appliances. "In discussing research for the gas industry . . . we believe the entire line of domestic appliances must be tailored to the task of meeting competition."


THE INGENIOUS FLAME DOES EVERYTHING
This THERMOCOUPLE PILE is generating electricity
from the heat of this Bunsen burner
• DRIVE THE BLOWER FAN ON YOUR GAS HEATING AND AIR CONDITIONING
• SUPPLY THE ENERGY TO ROTATE THE TUMBLER ON YOUR GAS DRYER
• GENERATE THE POWER REQUIRED FOR THE AUTOMATIC CONTROLS ON YOUR GOLD STAR RANGE

A Gas-powered radio is helping Oklahoma Natural Gas Company sell its customers that the *"Ingenious flame does everything."* A small transistor radio—powered by 14 thermocouples heated by a gas flame—has been set up in the lobby of the Tulsa ONG office so when customers come in to pay their bills they hear the small radio blare forth and see a sign emphasizing how the ingenious flame can do everything.

Gas dishwasher—A brand-new gas appliance, an automatic gas dishwasher, developed by Preway Inc. had its premiere showing at the January sales conference of the Florida Natural Gas Association. The new appliance is the result of over 15 years of research and development by Preway and has four basic features that set it apart from other dishwashers — radial wash arms, complete flexibility in racking, thermostatically controlled gas water heater, and high temperature sanitation rinse and drying zone.

OPERATOR'S REPORT: "With these 705-B's equipped with Hydra-Crowd, we can always use full power in all types of digging conditions. And there's very little hand work since the vertical boom lets us dig right up to sidewalks, curbs or obstructions without fear of damaging the machine or obstructions."

EXTENDING GAS SERVICE moves at a fast clip as one of the utility's fleet of 705-B's trenches 10" wide and 5' deep. Spoil may be discharged to either side of trench, and optional attachment permits machine to do its own back-filling.

Working in Denver suburb, this Model 705-B cuts 65-ft. service from house to main line, double cutting the trench in the middle of the street for a fast tie-in of service to main line. Exclusive Hydra-Crowd and fluid coupling bucket line drive permit operator to uncover main line without damage.

Model 772 (shown) is your best buy in the general wheel ditcher utility range—cutting widths from 12-14" and 5'6" deep. Model 773 offers same exclusive features plus wider track gauge and pads for greatest flotation.

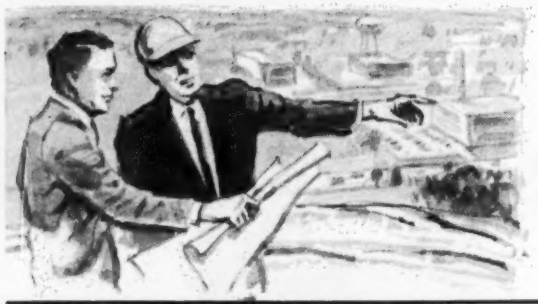
Manufacturer of the only modern ditcher line

Representatives in Principal Cities of the World

Barber-Greene BG

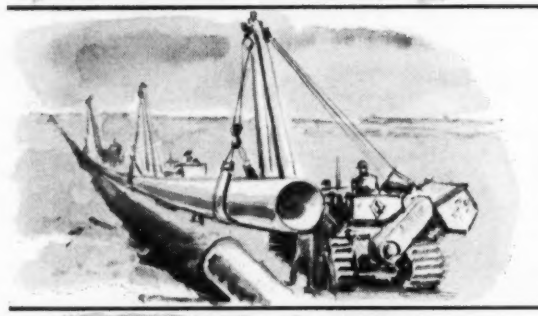
Main Office and Plant AURORA, ILLINOIS, U. S. A.
Other Plants: DeKalb, Milwaukee, Detroit, Canada, England, Brazil, Australia

CONVEYORS • LOADERS • DITCHERS
ASPHALT PAVING EQUIPMENT



FEASIBILITY STUDIES

PROJECT ENGINEERING



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- station work
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FINANCING

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Total Project Management

A Complete Service to the Pipeline Industry offered by

SOMERVILLE CONSTRUCTION CO.

"Sign of Satisfaction" Ada, Michigan

Calendar

OF COMING EVENTS

April

4- 6 A.G.A. research and utilization conference, Sheraton Cleveland Hotel, Cleveland, Ohio.

6 Pennsylvania Gas Association, fourth annual 1-day distribution conference, Tally Ho Inn and Hotel, Valley Forge, Pennsylvania.

6- 7 PCGA distribution conference, Biltmore Hotel, Los Angeles, California.

7 Maryland-District of Columbia Utilities Association spring conference, Lord Baltimore Hotel, Baltimore, Maryland.

9-13 ASME Oil & Gas Power conference and exhibit, Jung Hotel, New Orleans, Louisiana.

10-21 American Welding Society, International Institute of Welding, annual convention and welding exposition, Sheraton-Atlantic, New York, New York.

11-13 A.G.A. sales conference on industrial and commercial gas, Prince Edward Hotel, Windsor, Ontario, Canada.

13-15 GAMA annual meeting, Boca Raton, Florida.

16-19 A.G.A.-EEI national conference of electric & gas utility accountants, The Chase-Park Plaza Hotels, St. Louis, Missouri.

17-18 PCGA commercial-industrial sales conference, Los Angeles, California.

18-20 Southwestern Gas Measurement Short Course, University of Oklahoma, North Campus, Norman, Oklahoma.

20-21 Indiana Gas Association annual convention, French Lick, Indiana.

24-26 Southern Gas Association, annual convention, Roosevelt and Jung hotels, New Orleans, Louisiana.

28 NGAA Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Oklahoma.

30-May 2 Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans, Louisiana.

May

3 PCGA accident prevention roundtable, Biltmore Hotel, Santa Barbara, California.

8-12 A.G.A. operating section distribution and production conference, Sheraton Hotel, Philadelphia, Pennsylvania.

14-18 National Fire Protection Association annual meeting, Detroit, Michigan.

15-17 A.G.A. mid-west regional gas sales conference, Edgewater Beach Hotel, Chicago, Illinois.

17-19 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pennsylvania.

25-26 Natural Gas & Petroleum Association of Canada, annual meeting, London, Ontario, Canada.

26-27 Florida Natural Gas Association, American Hotel, Bal Harbour, Florida.

June

5- 6 A.G.A. eastern regional gas sales conference, Pittsburgh Hilton Hotel, Pittsburgh, Pennsylvania.

6- 8 ISA summer instrument-automation conference and exhibit, Royal York Hotel, Toronto, Ontario, Canada.

Newsreel

Southern Gas Association's 53rd annual convention in New Orleans April 24-26 will highlight new developments in the gas industry with such exhibits as several gas turbines, a wall furnace that uses thermoelectricity to operate a circulating fan and blower, a fuel cell prototype, several items developed by United Gas Instruments Division, an epoxy-joined line pipe display, a gas-fired infra-red residential space heater and other new developments.

Armed with a program planned especially to spark interest of all associated with the natural gas industry, Convention Chairman H. Vinton Potter of Tulsa, confidently predicts 1961 SGA annual meeting will rank among best of S.G.A. conventions. "Variety has been the watchword in our planning for this convention," Potter says, "and I think the convention committee has put together a program that will touch on virtually all varied interest of gas industry personnel." On tap is a program covering such diverse subjects as "Gas Turbines — The New Look in Air Conditioning and Power Generation" and "Meterology Looks Up."

Featured speaker at the concluding General Luncheon will be Dr. Murray Banks, a psychologist with a sense of humor, who will suggest: "How to Live With Yourself." Dr. Banks, a much sought after speaker, is a nationally syndicated columnist and has written two best-selling books.

Other top speakers scheduled for the General Sessions include Richard Harkness, N.B.C. Washington commentator and news analyst who will give delegates a look "Behind the Scenes in Washington"; and A.G.A. Managing Director C. S. Stackpole who will peak into the future in his visual presentation and commentary entitled "The Gas Industry in 1971 and You Are There." A host of top flight speakers will participate in section programs including Dr. Willis M. Tate, president of Southern Methodist University; James F. Oates, Jr., president of Equitable Life Assurance Society; Dr. Martin Goland, president, Southwest Research Institute and P. V. Mullins, general manager of helium operations for the U. S. Department of the Interior Bureau of Mines, Amarillo, Texas.

Topics ranging from cooking to use of liquified natural gas are scheduled for the Distribution and Production Conference of the American Gas Association to be held May 8-12 at Sheraton Hotel in Philadelphia.

Speakers and discussion leaders during the 5-day conference will total 169. General sessions will be held in the morning, while in the afternoon smaller meetings of more technical interest have been arranged.

Highlights of the meeting include speeches by C. R. DeHaven of Philadelphia Gas Works, whose topic will be "Customer Opinion Evaluation By Surveys"; Solon Walker of East Tennessee Natural Gas Co., "Corrosion Control and Management"; T. L. Robey, director of research, A.G.A. of New York, "Research Report"; and A. H. Mortenson, industrial consultant of New York, "Work Simplification — A Top Management Philosophy."

Dr. Martin A. Elliott, director of Institute of Gas Technology, will discuss "Availability and Future of Natural Gas" and, A. W. Mellen of Air Products, Inc. will discuss "Storage and Transportation of Low Temperature Fuels."

Gascool assets acquired by Aero-Test Equipment Co. Inc. Gene Walker, president of Aero-Test Equipment Co., Inc., Dallas, Texas, has announced expansion of his firm through acquisition of assets of *gascool* division of Vector Engineering Contractors, Inc. *Gascool* line of gas engine driven air conditioning equipment which will now be manufactured by the *gascool* Division of Aero-Test, includes 3 to 15 ton size units with self-contained air cooled condensors, and 7½ to 30 ton models with remote air or water cooled condensors. Roof-mounted combination heating and cooling units, 5 to 10 ton, will also be included.

E. F. Bilger, former manager of *gascool* at Vector, will continue in the same capacity at Aero-Test. All unexpired warranties on *gascool* equipment have been assumed by Aero-Test; and a complete stock of repair parts and service information are available for all *gascool* units now in service. This includes all commercial, residential, and institutional installations.

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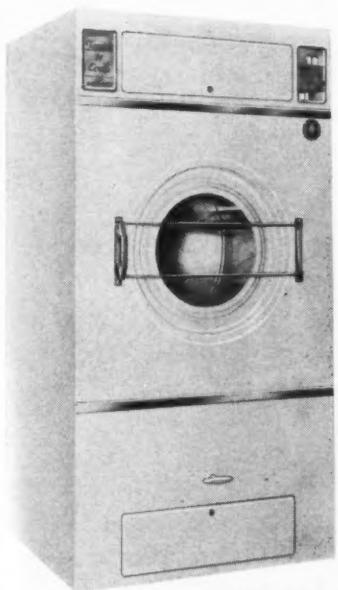

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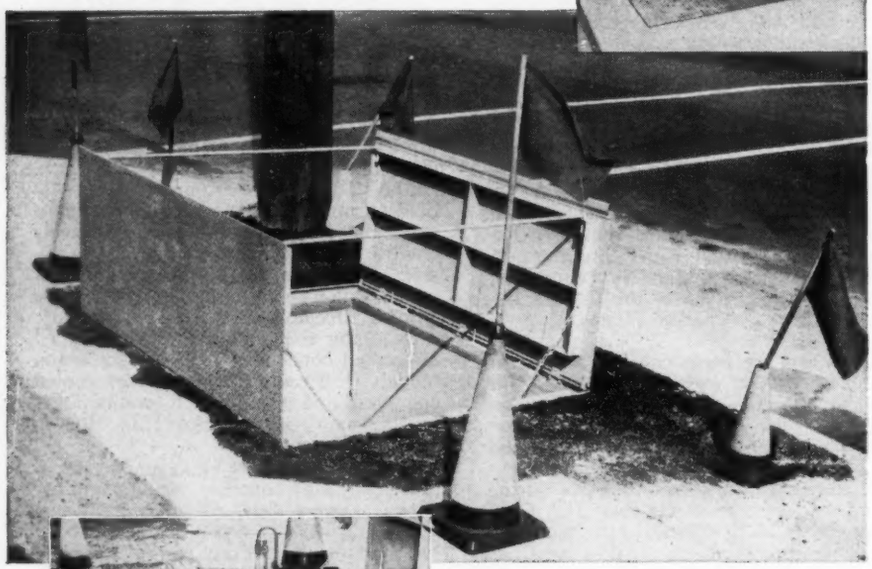

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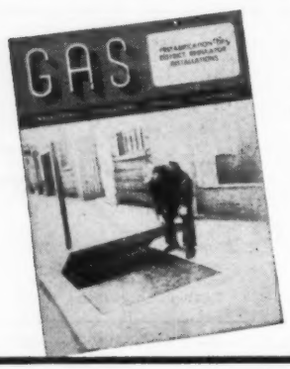

Send coupon today for FREE copy of article in Gas Magazine, entitled: "Standardization and Prefabrication of District Regulator Installations."

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Newsreel

Mapped for 1961 is the biggest air conditioning sales campaign in the history of the gas industry. The aim: Increase sales 70 percent. Armed with new unit capacities and designs from 2 to 6.5 tons, the gas industry expects to increase its sales to at least 25,000 units compared with 15,000 sold in 1960.

To plan this stepped-up emphasis on air conditioning, 75 gas companies throughout the U.S. send 260 representatives to a series of meetings in Birmingham, Dallas, Chicago, and Boston sponsored by the American Gas Association. Executives attending these meetings were told gas air conditioning market is practically untapped. They heard speakers predict in the next 12 to 18 months new units would be manufactured that will quadruple to 80 percent the market for gas air conditioning.

It was stressed that an aggressive air conditioning sales program is of primary importance to every utility company and that an adequate sales force — a minimum of one salesman for every 40 units of sales is essential. Gas companies that lead the field in air conditioning sales were cited as examples at the meetings. In each case these companies emphasized top-calibre sales effort, company-wide recognition of the importance of air conditioning department, service responsibility, hard-sell promotion, and aggressive top management support. First, high installation standards and service responsibility must be maintained, executives were told. Secondly, special summer rates and flexible, long-term financing or leasing programs were recommended.

Computer nose count. A computer census report appearing in April issue of *DATA PROCESSING magazine* shows 4927 commercial digital computers in use at the beginning of 1961. This includes 51 models of various sizes, manufactured by 20 different companies. On order, to be delivered within 1961-62, are 6453 digital computers.

Experimental fuel cell of advanced type under study at the Thornton Research Center of Shell Research Limited employs electrodes of a new design, generates from 3 to 5 times more power per unit volume than similar low-temperature cells now under development. New cell consists of 20 units producing 50 watts of power at 25 C. Dr. D. P. Gregory, member of the Thornton Research team working on fuel cells is sampling the electrolyte in the cell.

"WE'RE EQUIPPING ALL OF OUR METERS WITH REEVES-VULCAN SYNTHETIC DIAPHRAGMS"

Nicholas O. Boutzilo, Distribution Engineer
Richard Meyer, Meter Shop Leadman, at right

PEOPLES GAS SYSTEM
Tampa and Miami, Florida

"When we converted to natural gas in 1959, two of our key plans were to improve metering accuracy and reduce meter maintenance costs," says Mr. Boutzilo. "We found we could do this by replacing leather diaphragms with Reeves-Vulcan synthetic diaphragms—in all new and replacement meters.

"During a three year change-out program on over 76,000 meters, we noticed that those still equipped with leather diaphragms had a tendency to run slightly fast. We therefore have discontinued purchase of any leather diaphragms. All meters and regulators are now being equipped with Reeves-Vulcan synthetics, at a rate of about 1000 a month.

"We've found that Reeves-Vulcan synthetic diaphragms last many years longer, and give us consistently accurate metering. They stay clean and never need oiling. They have reduced our meter maintenance costs considerably."

How about *your* metering efficiency? Improve it now with Reeves-Vulcan synthetic diaphragms. There's a model for practically every type of gas meter made. Both molded and crimped styles are available. Order from leading manufacturers or directly from:

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Men At Work

● **W. L. Lee,** native Atlantan and former executive vice president of Atlanta Gas Light Co., has been elected president of the company succeeding **D. A. Crawford** who has resigned. Recently elected to the board of directors as a new member was **Robert P. Shapard, Jr.,** president of the Spalding Knitting Mills and the American Throwing Co., two of Griffin, Georgia's largest industries.

● Brooklyn Union Gas Co. has announced the promotion of **Malcolm M. Chesney, Jr.** to manager of its economic research department.

● **Robert G. Thibault** has been promoted from comptroller to vice president-finance for Peoples Gas System of Florida.

● Consolidated Edison Co. of New York, Inc. has announced the appointments of **William J. Murphy** as general fuel agent, and **Atherton Thomas** as fuel agent. As a result of these changes, all fuel functions, consisting of coal, oil, and natural gas, will be coordinated under the jurisdiction of the fuel department.

● **P. H. DuVal** has been appointed manager of Cities Service Petroleum Co.'s natural gas division. He was formerly manager in charge of natural gas sales and crude oil supply and transportation for Arkansas Fuel Oil Corp.

● Southwest Gas Corporation of Las Vegas, Nevada, has appointed the Ed Belford Agency to direct special promotions for the company. **Miss Charlene Gardner** has joined the sales and advertising staff of the company; she will coordinate advertising and sales promotion for Southwest at their executive offices in Las Vegas.

● Laclede Gas. Co. has announced the following personnel changes: **Henry A. Frank,** formerly superintendent of the north district, street department, has been named assistant superintendent in construction and maintenance. **Walter C. Maag,** former assistant superintendent in the north district, becomes north district superintendent in the street department. **Joseph C. Vogt** and **G. O. Rhodes** have been named assistant superintendents in the north district. Vogt was formerly in charge of department's cathodic protection, inspection, and control branch; Rhodes was formerly foreman in the department. **Harlan G. Hunn** has been appointed general foreman in the street department.

● British Columbia Electric has announced the following personnel changes: **Harry L. Purdy,** executive vice president, has become president succeeding **Del Grauer;** he will be directly responsible for BCE utility operations. Grauer continues as chief executive officer and will hold the title of chairman. **A. Bruce Robertson,** vice president and general counsel, has been named senior vice president. **John J. Carson,** vice president in charge of industrial relations has been appointed vice president and assistant to the president. In this capacity, four divisions will report to him: Gas, transportation, public information, and industrial relations. **C. Roy Brookbank** succeeds Carson as director of the industrial relations division.

● **Harold R. Lauer** has been appointed manager of Michigan Consolidated Gas Co.'s new business division. In the new post he will head the utility's space heating, multiple housing, architect and builder contacts in connection with residential uses of gas.

● Iowa Electric Light and Power Co. has appointed **Peter A. Stover,** formerly chief mechanical engineer, as director of purchasing and stores. Company also announced the retirement of **Marvin Wright** as purchasing agent.

● **Robert C. Smith, Jr.,** has been named assistant manager for the North Shore Gas Co., a subsidiary of New England Electric System. He was formerly commerical-industrial supervisor of Mystic Valley Gas Co.

● **Malcolm C. Macauley** has been elected vice president and manager of Wachusett Gas Co., subsidiary of New England Electric System. He was formerly assistant manager of the North Shore Gas Co.

Charles C. Jones, retired executive of Philadelphia Gas Works and United Gas Improvement Co., died recently at his home in Philadelphia, Pa. In 1956 he retired as superintendent of PGW's distribution engineering division.

a recent major gas co. report shows:

in 1,000 leaks,

855

were caused by corrosion!

These figures are from an actual 11 month survey made by a major northeastern gas distribution firm. In other words, **85% of their pipe leakage was caused by corrosion.** And on pipe that had been supposedly corrosion-proofed through the use of wrappings and coatings!

Yet with the proper installation of Standard Magnesium Anodes most of these leaks **could have been prevented!** This would have saved thousands of dollars in repairs and unaccounted for gas and completely eliminated dangerous hazards.

Standard Magnesium Anodes are the answer to your leakage problems caused by corrosion on old as well as new pipe — no matter what the soil conditions. It'll pay you to consult one of our representatives concerning your leakage problems.

FREE: Write for folder describing the causes of corrosion and how to prevent it.

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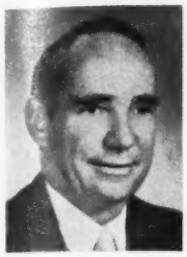


J. C. Dezelle

J. V. King

● **J. C. Dezelle** of Houston has been appointed a vice president of the Texas distribution division of United Gas Corp. Dezelle, assistant operating manager of the Texas distribution division since 1957 recently succeeded to the duties formerly directed by **James A. Wilson,** who has been transferred to Shreveport and appointed vice president in charge of all the company distribution operations including Texas, Louisiana, and Mississippi.

● **James V. King** has been named vice president and manager of operations for Western Gas Service Co. of El Paso. King joined Western Gas in 1945 when it was named Lea County Gas Co.; he has been general engineer since 1958.

● **L. Curtis Munn** has been named superintendent of Michigan Consolidated Gas Co. gas distribution department succeeding **George M. Arnold** who recently retired. **O. Bernard Weideman** has been named assistant superintendent of the gas distribution department.

● **F. Wayne Sharp,** vice president and treasurer of American Natural Gas Co., has also been elected secretary of the company and is now in charge of its New York office. In this latter capacity he replaces **Dudley B. W. Brown,** who has retired as vice president and secretary, but who continues as a director.

● Northampton Gas Light Co. has announced the following personnel changes: **Paul J. Reynolds** has been elected vice president and manager; he was formerly superintendent of utilization for Mystic Valley Gas Co., another subsidiary of NEES. **Thomas H. Rennell** has been named general superintendent of the company.

● Mystic Valley Gas Co. has announced the following personnel changes: **Richard L. Fite, Jr.,** has been elected vice president and manager succeeding **Everett C. Bryant** who has retired. Fite was formerly vice president of Lynn Gas and Electric. **Albert K. Peirce,** former assistant superintendent, has been promoted to superintendent of utilization. **G. Paul Magnitzky** has been named assistant manager succeeding **Ronald P. O'Hanley** who has retired. **George C. Ambrose** has been named manager of commercial and industrial sales.

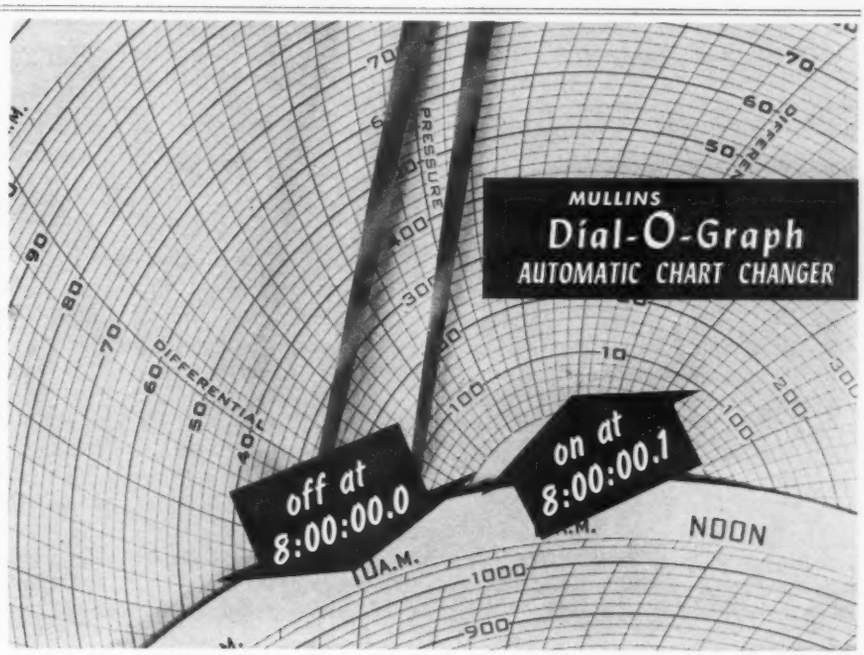
● **James Crilly** has been appointed superintendent of gas production at Elizabethtown Consolidated Gas Co.'s gas manufacturing plant in Elizabeth, N.J., succeeding the late Conrad Walp. Crilly was formerly assistant superintendent of dispatching and gas supply at the plant.

● **Volney H. Kyle, Jr.,** former executive vice president, has been elected president of North Carolina Natural Gas Corp. succeeding **P. McDonald Biddison** of Jacksonville, Florida, who submitted his resignation for reasons of health. Two new directors have been elected to the Company's board of directors — **Albert H. Daggett,** St. Paul (Minn.) business executive, and **William C. Gilman,** consulting engineer of New York City.

● **Carl W. Schofield, Jr.** has been elected vice president and manager of the Lynn Gas Co., a subsidiary of New England Electric System. He was formerly vice president and director of Northampton Gas Light Co.

● **Robert J. Owens,** Pacific Gas and Electric Co. safety administrator, has been promoted to safety engineer succeeding **Warren S. Hyde,** who retired December 31 after 41 years of service with the company. **Glenn A. Merritt,** presently PG&E automotive safety supervisor, has been appointed to assistant safety engineer and principal assistant to Owens.

● Federal Power Commission has announced the appointment of **Malloy J. McQueen** as deputy general counsel succeeding **John C. Mason** who had previously been promoted to general counsel of the FPC in September. McQueen was formerly associate general counsel of the Department of Health, Education, and Welfare.



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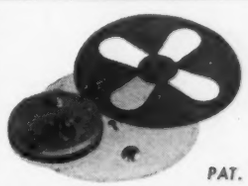
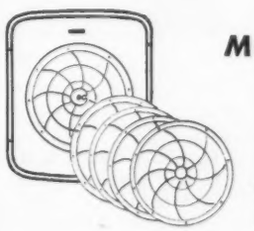


Dial-O-Graph is a simple, 3-piece attachment—Dial, Chart Plate, and Chart Drive (Mac-Nick)—that fits all recorders. Charts are slotted only in center margin . . . same pattern for all instruments, all change times. (Not shown is transparent guide plate and metal chart catcher for storage of completed charts.)



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Management Meets the Housewife

Southern Union Gas Company management men turned public opinion interviewers learn firsthand what customers think of gas service, rates, ownership

Dean Hale, *Editor*

"Good morning, ma'm, I'm from the Southern Union Gas Company and I'd like to ask you a few questions." With this introduction, the interviewer presented his business card and explained "your opinions will help us understand what our customers want, what they don't like, and how we may do better."

Friendly, brief, and to the point the interviewers asked their questions. The response from 481 homemakers in El Paso, Texas, was equally friendly and helpful.

At work interviewing customers were 16 of Southern Union Gas Company's management-level personnel. The occasion was the first public opinion survey ever conducted by a gas company using its top management personnel to do the actual field interviewing.

The survey was conducted for several purposes: First, to help strengthen the company's public relations in its El Paso district by showing its customers that it is concerned with their opinions about its service, and second, to obtain information to assist Southern Union in conducting its business in a more effective manner and to improve its service to its customers.

Another very tangible benefit was derived through exposure of the key company personnel to direct contact with a broad sample of Southern Union's customers.

Advance Planning Vital

Conducting such surveys is not a routine run-of-the-mill operation. For the survey to be effective, much careful advance planning is necessary. Interviewers must be oriented and daily briefing sessions are required. And when the interviewers are top management men, everything must flow smoothly to prevent loss of valuable time.

Planning for the survey began weeks ahead. Alex Louis, a Dallas marketing consultant, prepared the questionnaire to be used and developed a sampling method appropriate to the area to be surveyed.

Sampling was controlled so that the number of interviews in each area to be covered by an interviewer would be proportionate to the number of residential customers in that area.

Advance notice of the survey was given to the public through the mediums of newspaper, radio and television advertising, and publicity releases outlining what the company planned to do.

Several days before the actual survey began, the company ran an advertisement in El Paso newspapers calling attention to the forthcoming survey. The ad, signed by district manager E. C. Reddy, noted that Southern Union planned to ask 500 El Paso homemakers "what they think about Southern Union!"

The ad stressed that company officials were to make the survey and that they "wanted an honest opinion" about the kind of service the customer wanted

Southern Union Gas vice president E. M. Kelley, Sr., of El Paso introduces himself to Mrs. George Simpson, Southern Union customer, one of 481 El Paso homemakers interviewed in recent public opinion survey.

David J. Kerr, executive assistant, Dallas, tries out his Spanish during interview of one family covered during survey.

Opinions of Mrs. G. G. Kistenmacher of El Paso are recorded for survey by Southern Union vice president Tom Corr of Albuquerque.

from the gas company . . . and suggestions on how to improve the service. Customers were invited to call Reddy's office if they especially wanted to talk to one of the company officials.

On November 22, 1960, Southern Union hosted a press luncheon for representatives from all media. The company's straightforward "here's what we plan to do . . . may we answer your questions?" approach met with enthusiastic approval from members of the press. A week later Southern Union was host at a luncheon for leading businesswomen and presidents of El Paso women's clubs. Plans for the survey were disclosed and in a plea designed to enlist the women's aid, company officials asked the women to do just what they like to do — *"talk about us . . . and our planned survey."*

The Survey Begins

On "I-day Minus One" (the day before the interviews began, officially December 4), the survey task force gathered together for an official training session for all participants. Each member of the group took part in a trial interview with another member of the group in preparation for the next three days.

Participants in the survey group came from every part of Southern Union's extensive system and included E. M. Kelley, vice president, El Paso; E. C. Reddy, district manager, El Paso; N. P. Chesnutt, vice president and operating manager, Dallas; B. F. Wombacker, controller and assistant secretary, Dallas; Les Moore, director of industrial relations, Dallas; Jack Hertz, director of tax and insurance, Dallas; David J. Kerr, executive assistant, Dallas.

Tom Corr, vice president, Albuquerque; C. A. Stockhoff, district manager, Albuquerque; James Wyman, district manager, Pecos, Texas; Sloan Paxton, district manager, Carlsbad, New Mexico; J. Harvey Wilson, district manager, Clovis, N. M.; J. O. Carnes, distribution manager, Farmington, N. M.; Dan Crowley, district manager, Austin, Texas; Sam Holland, district manager, Galveston; and W. D. James, district manager, Flagstaff, Arizona.

Employees in the El Paso district had been briefed two weeks in advance and fact sheets were distributed to them on the first morning of the survey. *(One of the major residual benefits of the survey was the favorable impact on the attitude of the company's 240 employees in the El Paso area.)*

The city of El Paso was divided into 90 districts. Each participant was given six different scattered areas of the city, thus giving him a cross-section picture of the customers in the city.

The weatherman cooperated, but reluctantly, during the three-day interview period. Fortunately, a cold front that brought heavy snow to the area held off until the survey's conclusion.

Making The Survey

During the three days of the survey, the 16-man team kept on the go from sunup to sundown . . . and spent the evening hours reviewing and evaluating

the day's work. Officially, the interviewing hours were from 9 a.m. to 12 noon, and from 2 p.m. to 5 p.m. Briefing sessions were held each morning before the day's interviews began, and the late afternoon was spent "critiquing" the interviews made.

Carrying out the survey, the men used a "buddy system." Each pair of interviewers covered the same areas, but called on different homes. Not every door knocked upon proved fruitful — if the residents were not in, the interviewer moved to the next house on his list.

El Paso, on the international border, has many housewives who speak only Spanish. In these predominately Spanish-speaking areas, employees from the El Paso offices accompanied the interviewers, serving as interpreters.

In many cases, the interviewers reported, they were invited by housewives to have coffee or tea, and in every case, were treated cordially and hospitably.

Favors in the form of a Gold Star potholder and a copy of *Wonderful World* (a gas promotional magazine) were presented the housewives at the conclusion of each visit. The children weren't forgotten, either — they received lollipops.

In the survey itself, the housewives were asked questions about the service they had received from Southern Union; asked for their opinions and impressions of the company's rates, ownership, and regulation by governmental bodies; asked about its advertising, and asked about their preference of fuels for various household uses.

Following Up

After the survey was concluded, El Paso district manager E. C. Reddy wrote a personal letter to each housewife interviewed, expressing appreciation for the cooperation extended to the company and its personnel during the interviews.

Immediately after the results were in, research consultant Alex Louis began his initial tabulations. Some of the preliminary data were published in another advertisement in the El Paso newspapers not long after the three-day survey was made.

The advertisement related what the "500 El Paso Homemakers Think of Southern Union Gas Company." Included were such facts as:

- More than 9 out of 10 have a favorable opinion of Southern Union.
- Among customers who have requested service, 96% were satisfied with the promptness, efficiency, and courtesy of (Southern Union) employees.

C. A. Stockhoff, Albuquerque district manager, is accompanied by Mary Olivares of Southern Union's El Paso office, who served as interpreter during interviews in predominately Spanish-speaking areas.

I'M ASKING

500 EL PASO HOMEMAKERS

WHAT THEY THINK ABOUT SOUTHERN UNION!

In the next few days, a group of Southern Union Gas Company officials and myself are going to make personal calls on 500 El Paso homes. I wish we could call on every homemaker in our city, but, of course, this would be impossible.

What we want is your honest opinion about Southern Union. Are we giving you the kind of service you want from your gas company? Do you have any suggestions as to how we might improve our service?

We're going to hear some good ideas — I'm certain of that. Some will be suggestions that we can put to use. Others, we may not be able to follow. But we want to hear them, anyway.

If your home is visited, I hope you will speak up. In fact, if you especially want the opportunity to talk with one of our officials, then please call my office (KEystone 3-8411). We'll make a special trip to see you.

I think giving you a chance to help us originate improvements in our service is a good idea for us and for you. Later on we will report to you the results of our calls.

District Manager

One more modern thing at your fingertips

SOUTHERN UNION GAS COMPANY

Advance notice via newspaper advertisement preceded actual survey, told why company was making survey, asked customers to participate.

The ad's copy also pointed out that Southern Union's rates for gas were regulated by the city (a fact that many customers did not readily know) and that Southern Union was owned by stockholders . . . 16,500 of them . . . including nearly 600 in El Paso.

Interviewers Liked It

Sloan Paxton, district manager in Carlsbad, New Mexico, for Southern Union, fairly well summed up the feeling of the 16-man management/interviewer team with these remarks: "I am grateful for the experience because it adds much to the overall knowledge of the problems faced, not only by our company, but the entire gas industry."

Other members of the team point out that their survey experience is helping them in doing a better job in understanding customer needs, in building better public relations, and in giving them a better understanding of the entire company-customer relationship.

Consultant Louis notes that the overall survey results compare favorably with national attitude "norms." Louis took the data acquired at El Paso to his Dallas headquarters, put it on IBM cards, and cranked out useful data for Southern Union's management.

Among his findings:

- On customer opinions of the company:
  - 63% reported very favorable
  - 29% reported fairly favorable
  - 2% reported not very favorable
  - 6% reported "no opinion"

Generally, Southern Union occupies a favorable public relations position with its customers. The survey did uncover some interesting facts:

- Few customers realize or have heard about the company's part in programs to help the schools, churches, or city as a whole.
- Few people (only about one-third) realize that the City of El Paso regulates gas rates charged by the company (even though nearly all customers favor regulation).
- Nearly half of the company's customers did not know the company is a stockholder-owned company, as distinguished from a government-owned enterprise. Even so, an overwhelming majority favored private ownership.

These aren't unusual findings, consultant Louis points out. The same findings would be generally true in most other parts of the U. S. (and were, comparable to results shown by the nation-wide AGA-INGA study made in 1959 of the gas industry in the U. S.).

Using the Survey Results

As a result of its El Paso survey, Southern Union knows more about its customers, has a basis for improving its service, and is working earnestly to improve its public relations through informing the public in those areas where knowledge is lacking.

Results of the survey have been the subject of several critiques for key personnel in various offices on the company's system. As the results are studied, more and greater use of the knowledge gained will help the company improve its operations. * * *

Fig. 1. **Buried regulator station** located in a commercial zone adjacent to a residential area. Remote control equipment is housed in small building to rear. Station handles 5 Mcfh with 30 psi inlet pressure, 17 psi outlet pressure. Valve regulators used are 8-in. size.

Valve-Regulators For Gas Flow/Pressure Regulation

Take another look at the valve-regulator! It can save money by eliminating excess piping, permit below-grade installations, reduce pressure drop, and help reduce noise levels

Orrin F. Nelson, *Supervising Engineer, Northern Illinois Gas Company, Bellwood, Illinois*

INCREASED LOADS have created problems in both existing regulator stations and in designs of new stations. Among these problems are noise abatement, load factors caused by the wide difference between summer and winter demands, large size regulators or increased number of regulator runs, and how to get increased flows through existing runs with minor revisions.

Northern Illinois Gas Company has all of these problems and has experimented with valve regulators and piping modifications to try to minimize some of the problems.

Our interest was aroused by a demonstration of a cylinder operator installed on a shut-off valve of a conventional regulator run. This equipment was a standard conversion unit supplied by Nordstrom Valve Company. The valve regulator performed well on either flow or pressure control and at either high or low flows. The many possible applications of this type of equipment intrigued our station design engineers, and, before long, we were trying many different types of operators and valves.

The use of plug valves for regulators is not new. Other companies have used them for a number of years with good and, I suppose, bad results.

Many of the first units we tried were discouraging for a multitude of reasons. The first unit was installed on a standard pattern Fig. #2025 Nordstrom Valve. The equipment was transferred to another station and installed on a Fig. #2149 valve, which has an equalizer ring between the plug and the valve stem. Excess clearances in this equalizer ring produced lost motion and the unit "hunted" very badly. When the clearances were minimized, the unit worked satisfactorily. Bleed gas from the four-way valve in the positioner was excessive and had to be reduced somehow. The manufacturer has helped on this. The plug required grease and the cylinder needed oil. We found we could not pick up oil with a conventional oiler, so the cylinder was modified to include an oil felt ring between the cups in the piston. Foreign particles worked their way into cylinders, cutting piston cups and cylinder walls. This was prevented by a cindered metal filter installed in the supply gas line. These were some of our problems.

Up to this time we had experimented only with valves above-grade. Our next step was a below-grade valve. This unit

had a rack and pinion head, which — while good for on-off use — is a trouble spot for a regulator valve. Excess clearance in gearing will cause the unit to "hunt".

One probably wonders whether valve regulators are worth the trouble to investigate. We believe that few people recognize the potential value of such units to gas utilities, so we offer the following advantages to stimulate interest.

First, let's look at a new station design. It is possible to install all piping and valve bodies below grade with only the top works or operators above-grade. In such an installation, noise can be controlled and no building will be required. Thus, important savings become possible, especially in a populated area. Excess piping, usually required to install conventional regulators, also is eliminated.

Fig. 1 is an example of a buried station located in a commercial zone adjacent to a residential area. The small building houses the remote control equipment. This station is capable of handling 5 Mcfh with 30 psi inlet and 17 psi outlet pressures. It is equipped with two flow control runs, each with pressure monitors, and two pressure control runs, also safety monitored, that will take over in case of telemeter line or control failure. The valve regulators are only 8-in. in size. The noise level from this station is below that of the passing traffic.

The station shown has inlet and outlet shut-off valves but we believe that with more operating experience, we could eliminate the downstream shut-off valve. Our reasoning is that the monitoring valve normally is wide open and will not be required to regulate; therefore, it will not require maintenance and thus can serve in the dual role of monitor and shut-off valve.

Now let's look at increasing loads through an existing station. The largest pressure drop is probably caused by a conventional regulator that can be replaced by a valve regulator with a minimum of piping revision. Or a system change could necessitate the addition of a monitoring regulator. Often, no additional space was allowed for a second unit. Why not equip the existing shut-off valve with a piston operator and minimize revision cost? It may also be possible to utilize a by-pass valve, converting it to the extra run needed for capacity. These ideas should stimulate thinking about valve regulators.

Use of valves as regulators has not been limited to plug valves. We have in service many sliding disk valves manufactured by the Okadee Valve Company. These units are full opening, have metal-to-metal seats, and require no lubrication. Their capacities are greater than conventional plug valves. They can be installed either above grade or buried.

This unit has been developed jointly by three companies — Okadee Valve, Miller Fluid (the cylinder manufacturer), and Northern Illinois Gas. The unit is designed so that a simple extension will convert it for buried use. The percentage of valve opening is clearly readable on an indicator located above the piston. The positioner can be changed from "AIR TO OPEN" to "AIR TO CLOSE" with a minimum of effort. The cylinder is a "special", developed to insure no leakage at temperatures ranging from —20 F. to 125 F. It has *Teflon* rod packing and expanded *Teflon* cups; the bore and rod are chrome plated and require no lubrication.

Various designs of this valve regulator have been tried in this development. Some have been in service more than three years. These have been disassembled for inspection and seat wear has been checked. Our first units were double-seated valves and in a few cases wear was found on the upstream disk; however, the downstream or "working" seat and disk showed no signs of wear; they were re-installed and are still in service.

We have installed regulators both above and below grade. The units installed have been interesting because of their large capacities, stability of either flow or pressure control, and good turndown characteristics.

Noise problems are not always eliminated simply by burying a valve regulator. Noise is reduced but it will transmit from the extension and the portion of the regulator extending above grade. Noise also will carry both upstream and downstream and be very evident if piping should come above grade.

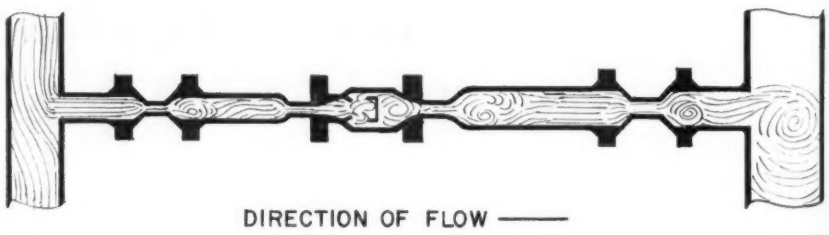


Fig. 2. **Many points of turbulence** are produced in a conventional regulator piping run, as shown in this cross-section. From left, inlet is usually smaller diameter pipe than the header to which it is connected; gas then goes through venturi of a common plug valve, through a reducer fitting and then through the regulator; downstream of regulator is the reverse.

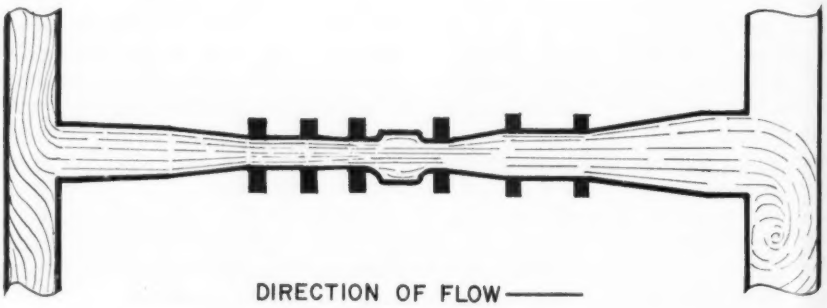


Fig. 3. **Improved design of regulator piping run** where valve regulator is used has greater capacity due to smaller pressure drop header-to-header. In this run, long taper reducers are used and the downstream reducer ends with a nozzle opening the same size as the header. Inlet and outlet valves need only to be the same size as the regulator. (In design shown, they were moved out for ease of operation and increased in size to avoid pressure drop through small diameter "spool" pieces.)

Fig. 4. **Station just completed** incorporates latest ideas — long tapers, valve-regulators, etc. — into the design.

Fig. 5. **Flow control regulator** with safety monitor and shut-off valves. Long taper reducers are also visible.

For example, a pre-heater upstream of a regulator can be an excellent sounding board; an orifice pit either upstream or downstream could have the same effect. Snubbers installed both upstream and downstream appear to be the best answer to minimize noise — they simply absorb it. But snubbers cause an additional cost and we hope they will not be required in the future.

Through observation of the many units, it has been obvious that other methods can be used to help minimize turbulence that produces noise. We believe a careful appraisal of piping — covering such items as reducers, valves, and branch fittings — will bring the most economical solution to noise problems.

To explain this, a reference to the flow in a half section of pipe is made in Fig. 2. The inlet is usually a smaller pipe than the header to which it is connected. From here we send gas through the venturi in a common plug valve, then past a reducer to the regulator valve. Downstream is the reverse.

By the time we pass the gas through the regulator run, we have produced many points of turbulence. It is possible to minimize this as shown in Fig. 3. In this regulator run we have used long taper reducers and the downstream reducer has ended with a nozzle opening the same size as the header. The interesting items in this piping are the size of inlet and outlet valves, and the additional capacity due to the smaller pressure drop from header to header. Shut-off valves can be smaller than the plug valves in Fig. 3. They only need to be the same size as the regulator. In this design, however, they were moved out for ease of operation and were increased in size to avoid the pressure drop through small diameter "spool" pieces.

Fig. 4 shows a station just completed that has these latest ideas incorporated into the design. Fig. 5 shows the flow control regulator with safety monitor and shut-off valves. The long taper reducers also are visible. Space has been allowed for snubbers; however, we hope they will not be required. The design of this station, for main line flow control is 30 Mcfh with 400 psig inlet and 150 psig outlet pressures. The control valves are 8-in. and are expected to handle half of this load per run.

Valve regulators have helped us with the design of new stations and the redesign of existing stations. We feel they definitely have a valuable place in gas pressure and flow regulation. We are confident that many other applications of these units can simplify the present costly regulation designs. * *

Pipe squeezing operation begins by heating the pipe to 1600-1700 F.

PIPE SQUEEZING

New technique for closing and reopening small mains and service lines for repairs

AGJ Special Report

A pipe squeezing technique useful in repairing leaks in service lines and small mains and for closing services and small mains where necessary, has been worked out during the past few years by Southern Counties Gas Company's construction and distribution department.

The methods and equipment developed by Southern Counties have led to an interest in the technique on the part of manufacturers of distribution equipment. Using in part the findings and experiences of the Southern Counties people, two California manufacturers are now producing equipment for the pipe-squeezing process.

The squeezing method is being used to repair service where no tee is used in the connection at the main, as well as for the repair of smaller mains. Current experimentation is on 2 and 3-in. pipe, and the results promise continued success.

Before development of the present standardized equipment, gas distribution firms had, for a long time, been looking for a way to squeeze off portions of pipe in order to effect repairs under gas pressure.

Another pipe-squeezing device had been developed elsewhere several years ago, but various factors stood in the way of its widespread acceptance.

Southern Counties' construction and distribution personnel went on to develop a small mechanical pincher for use in emergencies only. The principal problem was in reopening the pipe after repairs had been made. When the pincher was used experimentally on steel pipe, the brittleness of the steel proved to be a problem, too. To solve both these problems, Southern Counties' people decided to try heating the pipe before pinching.

Their experiments showed that the squeezing or pinching process was aided greatly by heating, and that pipe responded very well to both the closing and reopening operations when heated to somewhere in the range of 1600 to 1700 F.

The only trouble with the heating process was that it allowed only a few seconds for the mechanically applied shutoff operation. The Southern Counties people, realizing the need for speedier equipment, sat down with equipment manufacturers and, with their help, worked out hydraulic equipment.

The hydraulic pump that resulted, and which is now in use, cuts the time of the actual closing and opening squeeze operation to approximately five seconds, giving an adequate margin of time for working with the heated pipe.

Development of the squeezing and reopening technique has enabled Southern Counties to make service connections without tees.

Savings in time and money are effected if at any time the service needs repair, as the service can be squeezed shut close to the main, repairs made, and the service then reopened. A repair crew by this method does not have to excavate so deeply or break as much concrete as with former methods and the closing and reopening time is measured in seconds as against minutes using traditional methods.

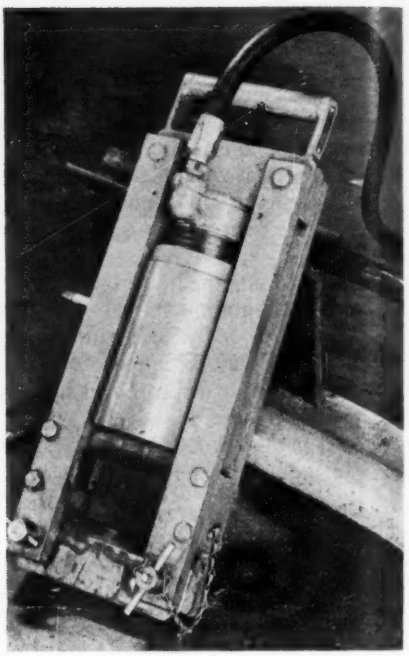
The safety factor is also improved — a bubble-tight shutoff can be obtained as against a possible leaky service cock or shutoff tool.

Pipe squeezers are now standard equipment with Southern Counties: each construction and distribution service truck now is equipped with a 15-ton squeezer, and some trucks have a 40-ton squeezer for larger diameter pipe. Mechanical pinchers are also carried on each construction and dis-

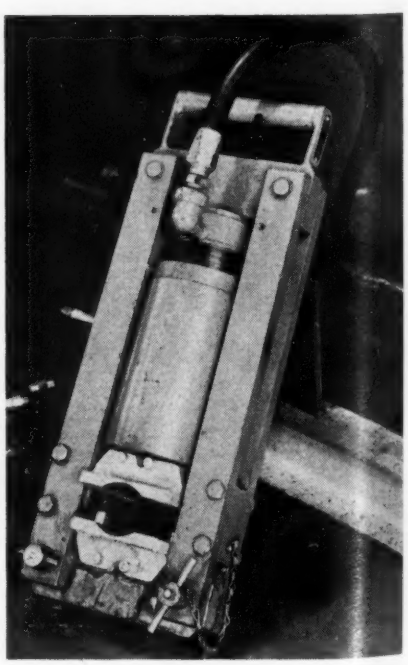
Hydraulic pincher is placed under section to be pinched, then section is squeezed off.

With special "teeth" added, pincher is placed over heated section of pipe at start of reopening process.

Pincher is removed after reopening. Only a very small indentation evidences where squeeze and reopening took place.



Pincher — as used in closing operation — is shown in closeup view.



With teeth added, pincher is shown as used in reopening operation.

tribution truck and on each customer service truck as well.

"In emergencies, such as where a service has been damaged by an outside contractor," one Southern Counties official said recently, *"we're not looking for 100% shutoff — just control. In such cases, we use the mechanical pincher, effect control, and leave the pincher on until a repair crew comes on the job and is able to effect permanent repairs. The pipe squeezing method is a very effective tool for achieving control under these circumstances."*

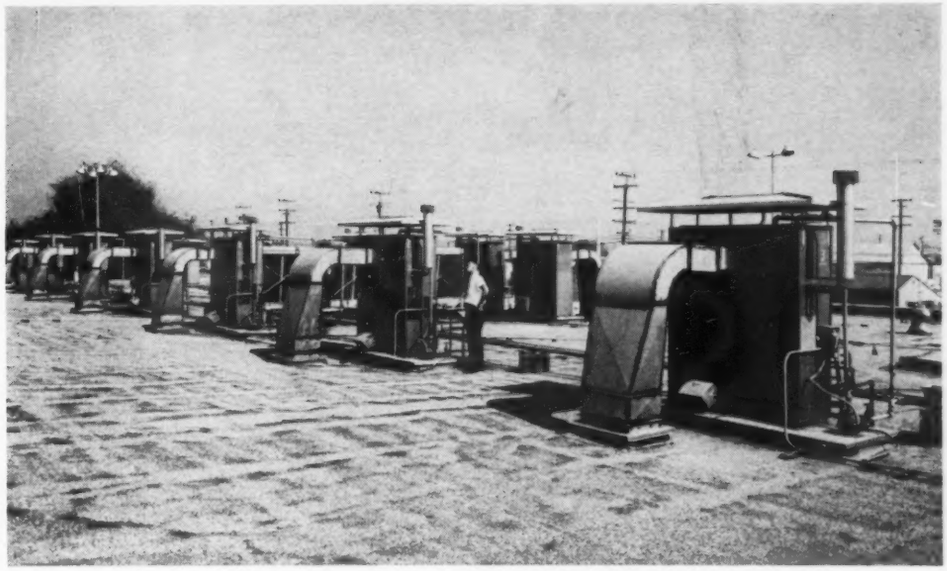
Metallographic studies were conducted for Southern Counties by Dr. David S. Wood, of California Institute of Technology, to determine the results of the hot pinching process on standard pipe. The results of these tests showed that hot pinching and hot reopening, performed in the proper temperature range, do not produce any detrimental effect on the pipe material.

Mechanical tests for strength and ductility were made on several types of ¾-in. pipe. Used pipe, retired from service by Southern Counties, was employed in order to obtain the minimum properties which could be expected under field conditions.

Tensile, hydraulic pressure, and bend tests were made on specimens of pipe which had been subjected to hot pinching and hot reopening operations. The results were compared with tests of the same kind made on un-pinched pipe. The results showed that ¾-in. service pipe subjected to the hot pinching and reopening exhibits strength and ductility nearly as good as that of un-pinched pipe and entirely adequate for service use.

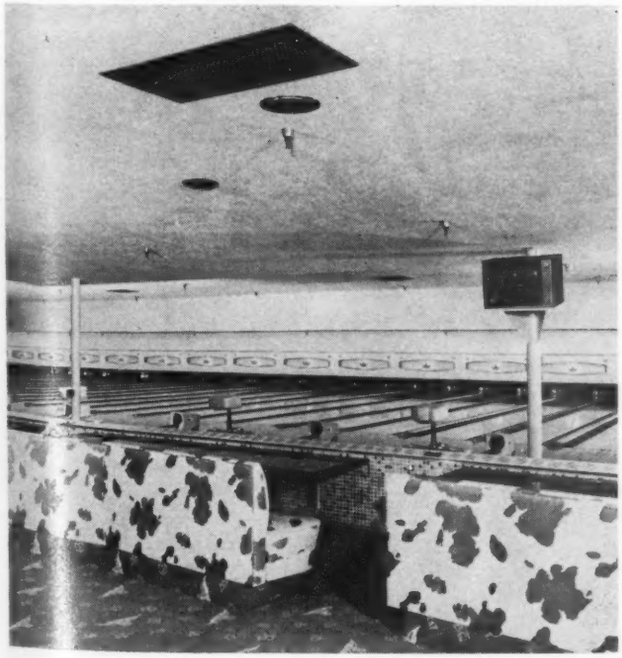
Although the circumference of the pinched pipe remains in somewhat deformed condition after both the hot opening and closing operations, the interior cross-section is sufficient to carry the required flow of gas.

Tensile tests were also made of welded connections between service pipe and main. Direct connection of the service pipe to the main was compared to connections employing tees. The tests showed that the minimum strength found for the direct connection was more than two-thirds the minimum strength found for tee connections, and is also entirely adequate for the service conditions. * * *



Fourteen roof-mounted 5-ton gas absorption units provide 70 tons of cooling as well as heating and other air conditioning, for the Pioneer Bowl. Installation employs a unique air flow pattern that directs coolest air over bowling approaches and also draws smoke and other pollutants away from the bowling area.

Roof-Top Gas A/C Units Heat, Cool Bowling Alley



Spectator area at Pioneer Bowl has air conditioning registers over bowling area and air returns behind spectator seats, resulting in steady air flow pattern.

A unique air distribution system that circulates conditioned air through the alley approach area, and uses 14 individual roof-mounted gas air conditioning units, is being utilized by a new Southern California bowling alley.

At the 32-lane "Pioneer Bowl" in suburban Norwalk, air registers are placed directly over the alley approach area so that bowlers have the freshest air in the house as they bowl. In addition, air returns are positioned behind spectator seating, causing fresh air to move first over the approach area and then through spectator areas.

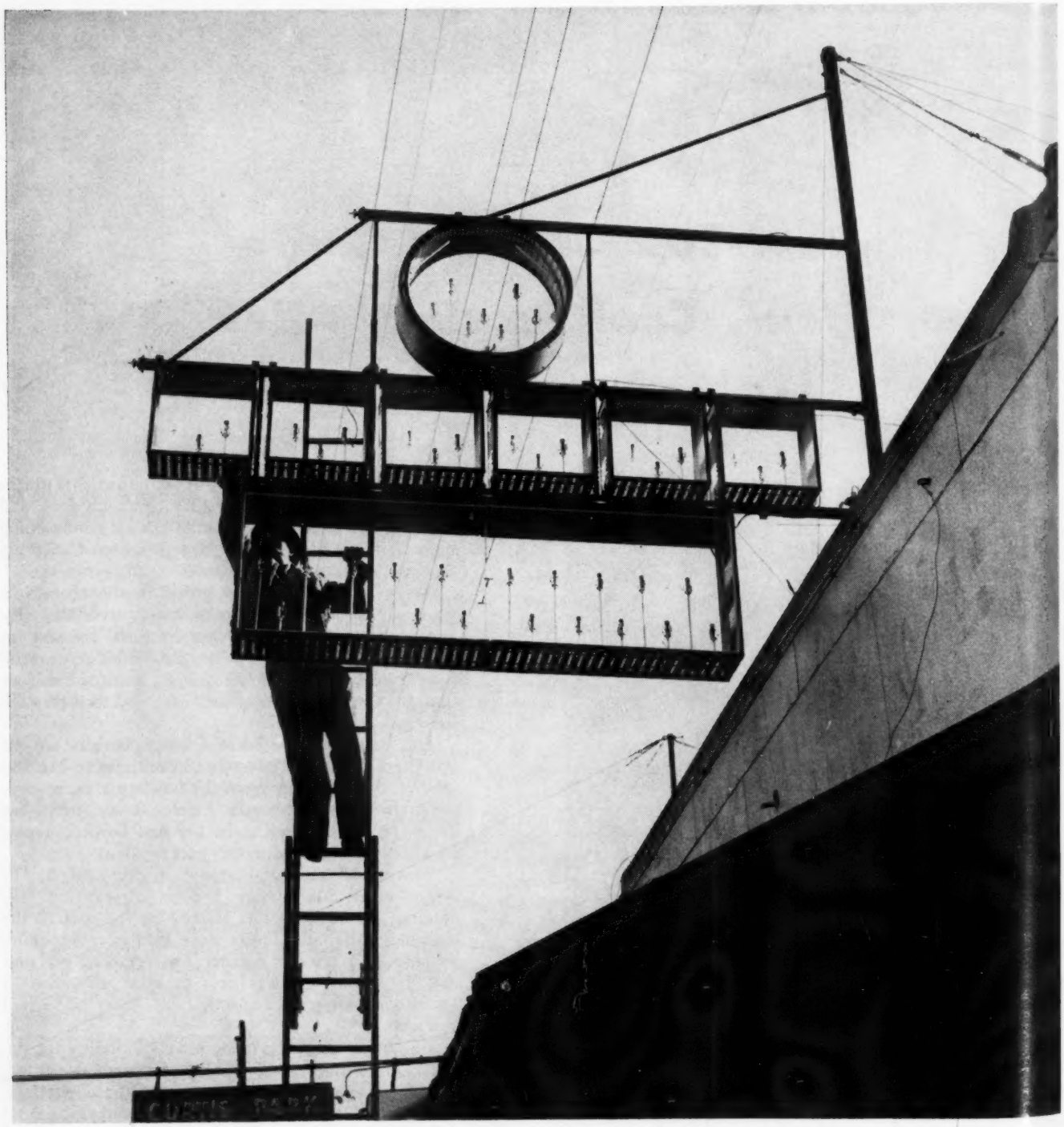
The design innovation not only provides coolest air where it's needed most, but also draws smoke and other pollutants away from the bowling area, according to owners Joe Loucostic and Joe Rose. The 70-ton gas system is believed to be the first bowling center installation of its kind in this part of the country.

Year-round air conditioning is provided by 14 Arkla-Servel Sun Valley five-ton absorption gas cooling and heating units located on the roof of the building. Installation costs were held at a minimum because only one air register was required per unit and the contractor was able to take advantage of quantity buying of registers and other identical components.

The gas units also provide air conditioning for the remainder of the bowling alley-recreation center, including a game room and nursery for children, a coffee shop that seats 60, and a bar and dining-banquet area accommodating about 150 persons. The center's cooking equipment also is gas. * * *

GASIGNS: *Revolution*

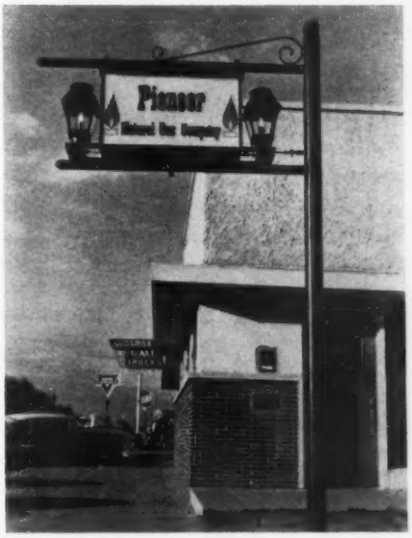
Dean Hale, *Editor*



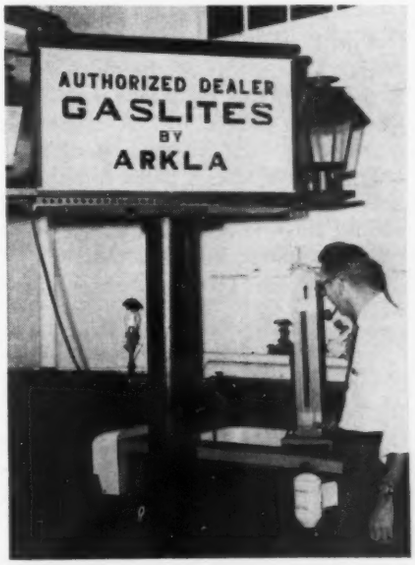
Up she goes! Workman makes adjustments during installation of a 9-unit, 45-mantle Gasign (45 mantles — count 'em!). Bottom panel is combination of two rectangular jobs.

in outdoor advertising

Twenty-nine different Gasign units make up this king-size sign for a furniture "supermarket."



Pioneer Natural Gas Company uses gas-fueled Gasign to promote use of natural gas. Signs can be post-mounted, bracket-mounted, or stub-post mounted.



Engineer Harold Meyer checks burner pressure of Gasign in laboratory. Design pressure is about 5-in. w.c.

THERE'S A REVOLUTIONARY NEW APPLIANCE ON THE GAS SCENE that's proving itself a great revenue builder as well as a shining example of what gas can do for modern business.

This profitable new load builder is the "Gasign," a gas-operated advertising sign that is the equivalent from a net profit standpoint, of two residential customers in load. Developed by ARKLA Air Conditioning Corporation and marketed since early 1960, the Gasign opens up a fabulous new field for gas utilities . . . especially when one realizes that 43% of the electric industry load is in lighting and their greatest lighting revenue comes from outdoor commercial applications.

How well the sign is doing in its first year on the market is seen in the number of units now in operation—over 2000 in 40 states. Many gas utilities are seeing for themselves how well the sign works, and many are successfully selling this unique new gas appliance.

The Gasign is especially attractive because it is:

1) Lower in first cost than competitive electric signs of the same or similar design;
2) Lower in maintenance cost, and
3) Lower in operating costs.

How It Happened

Over 18 months were spent by ARKLA's engineers in developing the Gasign. It is exciting not only because it is different in appearance from conventional backlighted signs, but also because of the manner in which it works and the materials that go into its fabrication. Four basic models and sizes are available.

Load building possibilities of the Gasign are first seen in its three to ten gas light burner assemblies that can be automatically controlled for minimum flame operation during the day and maximum brightness during the night. For example, an eight-mantle Gasign on 12-hour-daily operation is the equivalent of at least five continuously burning gas lights.

In most sections of the country, five gas lights burning continuously produce approximately the same total gross revenue as an average domestic customer. And with a 100% annual load factor, a Gasign is more than twice as profitable as the average domestic customer, who uses 80% to 90% of his annual consumption during the four or five coldest months.

Development of Gasign

Two big problems faced the developers of the Gasign. First, it was necessary to find an arrangement of burners that would permit efficient combustion and still give an optimum in lighting efficiency.

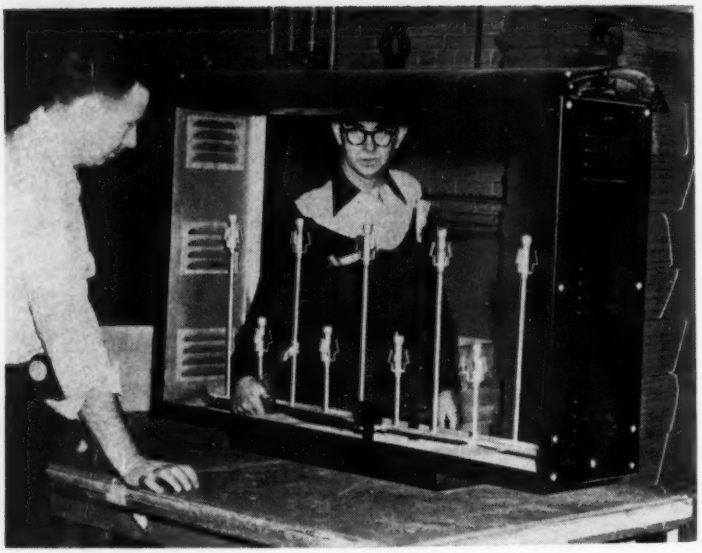
Second, it was necessary to find a material for use in the decorative side panels that would withstand high temperatures, transmit light effectively, be resistant to impact, and be reasonably priced.

Combustion. Development of the burner arrangement was done by a trial and error program that resulted in an arrangement that would permit dissipation of the heat, proper flow of combustion air, even distribution of light on the panels, and was fitted to the size limitation imposed on the developers by the size of the special tempered glass side panels.

In effect, it was necessary to fit three inter-related variables to a single condition in order to fit the size of the side panels, which are available from only one source in the world.

With a 100% load factor appliance burning 8 to 25 cu ft of natural gas per hour, automatic controls were deemed desirable as optional equipment. For operating economy, it seemed advisable to be able to turn the sign "down" to minimum flame during the day. The developers also wanted to animate or "blink" the sign.

A combination of this type would result in a unit that would be more



Gasign in process of assembly at ARKLA plant in Evansville, Indiana.

Nursery and garden center attracts customers with this model.

competitive in operating cost and in decorative and animation effect than anything the competitive electric signs could offer. Naturally, it was necessary that the control system should be gas operated, with no external wiring.

Result of these endeavors was development of a new revolutionary photocell control that generates its own electricity from a gas flame (utilizing thermocouples). The control automatically turns the sign down in the daytime and to full brilliance at night.

It also provides a control for animating or blinking at about any rate desired. This feature is available on current production models.

Side Panels. Greatest difficulty encountered in evolving the Gasign was to find a suitable material for the decorative side panels. In fact, the whole sign had to be developed around the only type and size of panel found suitable to the application. As stated earlier, this material is available from only one source in the world.

Among the problems encountered were:

1) Surface temperatures can reach as high as 350 F at the top of the panel;

2) Panel must be capable of withstanding shock, impact, intense heat, and possibly, somewhat explosive expansion and contraction due to extreme low temperature operation.

3) The material must be reasonably priced.

Every usable type of material available was tested. Included in the tests were various types of fiberglass cloth and a new quartz cloth developed in the missile field that have proven useful as insulators for the panels.

The special glass material finally adopted for the Gasign was originated in France. But even after finding a suitable material, the developers did not have all their problems resolved. More than nine months of trial and error research in cooperation with the manufacturers was required to develop a process whereby the glass could be glazed to give proper transmission, diffusion, light emission, and be available at reasonable cost.

More about the glass. The glass used in the Gasign is a special highly tempered product similar to that used in the TV commercial where a golf ball is driven against an "invisible shield." Depending on its thickness, the glass used in the panels is almost totally resistant to all types of impact except that of a point source.

Due to its high degree of temper, the glass can withstand almost any degree of heat concentration. It is also impervious to expansion and contraction damage from any temperature range that might be encountered. Strength of the glass is amazing. In proper thicknesses it will support a 200-lb man standing at its center with the panel supported at each end.

A translucent coat of white enamel glazed to the inside surface provides well-distributed illumination.

Field testing. No laboratory product can be acceptable until it has undergone an extensive and thorough period of field testing. Some 50 signs were tested for nearly a year at locations in 10 states before the decision to market the Gasign was finally made.

Significantly, there were no serious service or performance complaints about any of the 50 field test units. Some minor design modifications were made, but the Gasign remained basically unchanged from its original conception.

Gasign Construction

Four Gasign models were available —two rectangular models, one with 30 by 48-in. and the other 20½ by 36-in. panels; a 20-in.-square modular unit that can be stacked or arranged in combination for unusual types of display signs, and a circular sign 34-in. in diam.

Framing for the signs is mild steel, finished in classic black, and weatherproofed overall to prevent corrosion.

Mounting is by means of bracket arm hangers for a pipe and post bracket; the signs can be installed either on walls or on posts.

Individualized Messages. Actual copy for the signs can be either factory applied or done at local sign or silk-screening shops. ARKLA engineers have developed "specs" for the application of silk screen paints based on tests and experimentation by several display firms. Not all silk screening paints are suitable because of the heat generated and the outside exposure. *

No Insulators, No Cathodic Protection

H. C. Van Nouhuys, *Consulting Editor*

When the children were small it was the family custom on Sunday mornings to serve an added attraction of sweet rolls or doughnuts for breakfast. The reaction to this at first was rapid consumption of the sweets to the exclusion of other proper foods, hence the decree went forth that to obtain a doughnut, a piece of toast must first be eaten. Thereafter when one of the quartet reached first for a doughnut, another would chime out — "no toast — no doughnut".

By the same token Mother Nature decrees to all gas distribution men who desire cathodic protection for their distribution systems, that these gentlemen must first do a thorough job of insulating every meter if cathodic protection is to be feasible. The "sweets" of reduced maintenance in the years to come can only be achieved by intelligent preparation of the system — not digestive — to receive mitigative measures that will be most effective and least in cost at the same time.

CASE I: One company that had 3 rectifiers on its distribution system was concerned about the adequacy of the system. Test showed that less than 1% protection was being obtained. A pipe-to-soil potential change could not be detected even one block away from a rectifier, let alone the desired 0.3-v. change over the entire system! No check of the missing insulators had been insisted on before cathodic protection was installed.

CASE II: In another town, the gas company superintendent felt that the insulators had been conscientiously installed so the engineer went ahead with his current requirements testing. Results showed that more current would be required to obtain necessary protective potentials than if all the pipe were bare — which was proof that short circuits to the water system must exist, because the gas piping was known to have at least an average quality coating.

The company then obtained a foolproof type of insulator tester and proceeded to test each of the approximately 2000 services and farm taps, finding 6% missing or defective. Retest after repair showed that five rectifiers would then protect the entire distribution system and an 8-mile supply line as well, whereas previously it was doubtful if 20 units would have done the job. Even 1% defective or missing insulators can rob an existing system of appreciable protection, or raise the design requirements by one or more rectifiers.

Money spent on cathodic protection installation or survey is usually wasted unless isolation of the structure to be protected is effected first. Some companies perform their own test programs, while others prefer to contract the complete service. Regardless of the plan such a program is essential and its cost is quickly repaid if cathodic protection is planned, and less quickly if not planned.

CASE III: A 21-mile coated transmission line equipped with two rectifiers was discharging 22-amp and yet barely one-half of the line was protected; the other half fell below adequate protective potentials. Normally, one small rectifier should protect a line of this type.

It is anticipated that ample protection will be obtained when the 175 farm taps on the line are provided with insulators at the meters, thus cutting off well casings, buried water piping, underground tanks, and electrical grounds that are now appendages to the gas line as a result of short circuits through the hot water heaters.

The rectifier outputs will doubtless be reduced to less than half of present output as an added bonus — the savings in power paying for the cost of installing 175 insulators in a few months.

Types of Shorts. The fact that an insulator may be visible at every meter does not insure 100% effective isolation. Faults may be due to a defective insulator, a missing insulator, or a shorted insulator. An insulator test program now being carried out shows 256 faults (6.54%) out of 3911 tested. Of these, 50 or 1.27% are defective insulators, 55 or 1.40% were due to missing insulators, and 151 or 3.87% were shorted out due to the valve contacting the case. In the latter case, the short is temporarily cleared by inserting a small rubber disc, or other insulating material, between the valve and case.

It is interesting to note that of the 50 defective insulators, the majority were the latest type, thick nylon bushing in the swivel point, while only five or so of the earlier thin type were defective. And although an estimated 1000 insulating unions are included in the total tested, not one has been found defective. Out of 309 farm taps tested on another system on which a different type insulating union was used, however, three defectives were discovered. The mere presence of an insulator does not insure insulation!

Insulators are one of the fingers of the corrosion engineers' right hand. They are essential if cathodic protection is applied. If cathodic protection is not applied, insulators still serve to mitigate corrosion between unlike services buried in close proximity, and to prevent the hazards of alternating currents and lightning from grounding to the gas services and mains. * * *

Gas Reserves Hit All-Time Record

Natural gas reserves in the United States are at an all-time high — 263.7 trillion cu ft — despite another record-breaking year of gas production in 1960.

In an annual report released jointly with the American Petroleum Institute, the American Gas Association noted that new gas reserve discoveries last year were the third highest on record. Discoveries of new fields and additional pools found in established fields totaled 6.6 trillion cu ft; this record was exceeded previously only in 1953 and 1957.

Meanwhile, natural gas production climbed to 13 trillion cu ft last year compared with the previous peak of 12.4 trillion in 1959, when proved recoverable reserves were 262.6 trillion.

Texas and Louisiana, which account for more than two-thirds of the nation's proved gas reserves, had a total of 182.7 trillion cu ft. In 1959, the two states had reserves of 180.4.

Listed separately for the first time is Alaska, where exploration is in the earliest stages. Gas reserves rose sharply in the state from 57.9 billion cu ft in 1959 to 107.6 billion last year.

During the past decade, discoveries, revisions and extensions have increased the nation's gas reserves by 183 trillion cu ft. At the same time, total production soared to 104.8

NATURAL GAS RESERVES

*As of December 31, 1960**

(Thousands of Cubic Feet — 14.65 psia, at 60 F)

Total proved reserves as of December 31, 1959		**262,596,593,000**
Extensions and revisions of previous estimate during the year of 1960	7,332,840,000	
New reserves discovered in 1960	6,637,009,000	
Net changes in underground storage during 1960	226,228,000	
Total proved reserves added and net changes in underground storage during 1960		14,196,077,000
Total proved reserves, as of December 31, 1959 and additions during 1960		276,792,670,000
Deduct production during 1960		13,090,450,000
Total proved reserves of natural gas as of December 31, 1960		**263,702,220,000**

Reserves data are shown by states in Table 1.

*Report by the A.G.A. Committee on Natural Gas Reserves.

TABLE 1

Estimated Proved Recoverable Reserves of Natural Gas in U. S.

(Millions of Cubic Feet — 14.65 psia, at 60 F)

	Reserves as of December 31, 1959[b]	Changes in Reserves During 1960: Extensions and Revisions[b]	Discoveries of New Fields and New Pools in Old Fields[b]	Net Change In Underground Storage[c]	Net Production[d]	Reserves[b] as of December 31, 1960: Total (Columns 7+8+9+10 Also Columns 1+2+3+4 Less Column 5)	Non-Associated[e]	Associated[f]	Dissolved[g]	Underground Storage[h]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Alaska	57,975	36,993	13,000	0	305	107,663	95,811	0	11,852	0
Arkansas	1,422,817	83,115	36,360	211	82,793	1,459,710	957,514	287,932	209,222	5,042
California[i]	8,593,447	395,351	324,694	30,875	500,472	8,843,895	2,509,684	1,962,792	4,249,526	121,893
Colorado	2,496,159 (-)	474,828	121,520	565	100,662	2,042,754	1,294,053	258,434	489,538	729
Illinois	175,110	8,900	297	7,461	18,633	173,135	9,349	0	111,185	52,601
Indiana	35,088	1,001	284	1,692	3,945	34,120	1,100	1,200	19,875	11,945
Kansas	19,981,403	128,848	156,452	8,366	666,345	19,608,724	18,735,589	527,181	274,886	71,068
Kentucky	1,159,381	46,048	9,020	1,918	72,518	1,143,849	1,041,373	0	76,365	26,111
Louisiana[i]	59,853,920	4,333,983	2,254,600	0	3,056,362	63,386,141	50,527,589	8,956,486	3,902,066	0
Michigan	515,403	7,549	31,200	56,057	24,451	585,758	116,015	71,793	56,634	341,316
Mississippi	2,486,524	31,804	210,390	(-) 581	186,307	2,541,830	1,906,135	340,020	290,718	4,957
Montana	665,491 (-)	17,245	0	14,126	36,194	626,178	465,058	29,138	76,799	55,183
Nebraska	132,719 (-)	3,057	861	0	12,695	117,828	93,277	8,673	15,878	0
New Mexico	17,912,798 (-)	1,654,454	127,457	(-) 3,317	778,760	15,603,724	11,214,132	2,753,119	1,592,049	44,424
New York	106,519 (-)	7,588	420	1,662	4,812	96,201	36,841	0	138	59,222
North Dakota	1,206,542 (-)	35,415	0	0	20,106	1,151,021	9,453	340,400	801,168	0
Ohio	748,766	34,297	9,250	12,549	39,309	765,553	326,987	0	89,251	349,315
Oklahoma	16,651,292	975,342	665,460	1,084	993,975	17,299,203	12,275,573	1,943,428	2,973,501	106,701
Pennsylvania	1,051,972	191,836	18,000	27,448	119,671	1,169,585	714,941	0	22,940	431,704
Texas[i]	120,475,783	2,471,209	2,428,403	7,309	5,902,789	119,479,915	78,214,180	27,137,031	14,077,131	51,573
Utah	1,264,250	260,445	63,734	0	62,289	1,526,140	1,007,349	31,476	487,315	0
Virginia	38,632 (-)	3,300	300	0	2,342	33,290	33,290	0	0	0
West Virginia	1,593,551	318,967	71,488	37,001	189,882	1,831,125	1,472,197	0	63,633	295,295
Wyoming	3,847,064	199,836	93,719	1,148	207,018	3,934,749	3,197,676	157,435	558,066	21,572
Miscellaneous[a]	123,987	3,203	100	20,654	7,815	140,129	48,172	0	15,184	76,773
TOTAL	262,596,593	7,332,840	6,637,009	226,228	13,090,450	263,702,220	186,303,338	44,806,538	30,464,920	2,127,424

a. Includes Alabama, Arizona, Florida, Iowa, Maryland and Missouri.
b. Excludes gas loss due to natural gas liquids recovery.
c. The net difference between gas stored in and gas withdrawn from underground storage reservoirs, inclusive of adjustments and native gas transferred from other reserve categories.
d. Net production equals gross withdrawals less gas injected into producing reservoirs. Changes in underground storage and gas loss due to natural gas liquids recovery are excluded. Fourth quarter production estimated in some instances.
e. Non-associated gas is free gas not in contact with crude oil in the reservoir; and free gas in contact with oil where the production of such gas is not significantly affected by production of crude oil.
f. Associated gas is free gas in contact with crude oil in the reservoir where the production of such gas is significantly affected by production of crude oil.
g. Dissolved gas is gas in solution with crude oil in the reservoirs.
h. Gas held in underground reservoirs (including native and net injected gas) for storage purposes.
i. Includes offshore reserves.

trillion cu ft. Despite an increased demand for natural gas, there was an addition of 78.2 trillion to reserves, bringing them to the present 263.7 trillion.

Discoveries of natural gas liquids were the second highest on record. The 121.5 million bbl was exceeded only in 1956 when 128.5 million was found. Reserves of gas liquids total 6.8 billion bbl, an increase of 294 million over 1959.

Canada's natural gas reserves, reported annually by the Canadian Petroleum Association, also broke a record by rising to 30.6 trillion cu ft. The previous peak was in 1959 when 26.6 trillion was reported. Production totaled 539.5 billion cu ft, up sharply from 498 billion.

TABLE 2

Summary of Annual Estimates, Natural Gas Reserves, December 31, 1945 to December 31, 1960

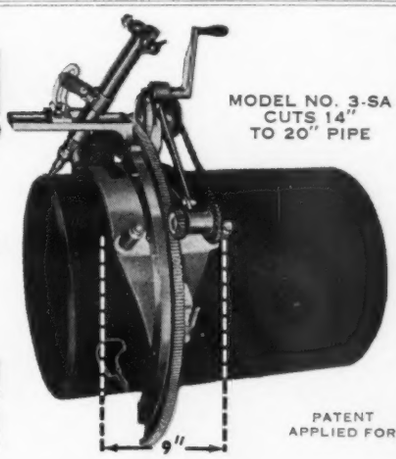
(Millions of Cubic Feet — 14.65 psia, at 60 F)

Year	Natural Gas Added During Year: Extensions and Revisions	Natural Gas Added During Year: Discoveries of New Fields and New Pools in Old Fields	Natural Gas Added During Year: Total of Discoveries, Revisions and Extensions	Net Change In Underground Storage	Net Production During Year	Estimated Proved Reserves as of End of Year	Increase Over Previous Year
1945						147,789,367	
1946	a	a	17,729,152	a	4,942,617	160,575,901	12,786,534
1947	7,570,654	3,410,170	10,980,824	a	5,629,811	165,926,914	5,351,013
1948	9,769,483	4,129,089	13,898,572	51,482	6,007,628	173,869,340	7,942,426
1949	8,061,429	4,612,870	12,674,299	82,746	6,245,041	180,381,344	6,512,004
1950	9,172,381	2,877,351	12,049,732	54,301	6,892,678	185,592,699	5,211,355
1951	13,013,606	3,039,385	16,052,991	132,751	7,966,941	193,811,500	8,218,801
1952	8,934,470	5,411,043	14,345,513	198,850	8,639,638	199,716,225	5,904,725
1953	13,371,355	7,081,661	20,453,016	516,431[b]	9,238,540	211,447,132	11,730,907
1954	4,632,309	4,966,894	9,599,203	90,906	9,426,509	211,710,732	263,600
1955	16,298,125	5,719,069	22,017,194	87,637	10,118,118	223,697,445	11,986,713
1956	19,214,604	5,636,476	24,851,080	133,970	10,907,926	237,774,569	14,077,124
1957	11,118,319	8,998,993	20,117,312	179,733	11,502,359	246,569,255	8,794,686
1958	13,388,808	5,611,098	18,999,906	57,902	11,485,026	254,142,037	7,572,782
1959	14,933,109	5,800,749	20,733,858	161,326	12,440,628	262,596,593	8,454,556
1960	7,332,840	6,637,009	13,969,849	226,228	13,090,450	263,702,220	1,105,627

a. Not estimated.

b. All native gas in storage reservoirs formerly classified as a natural gas reserve is included in this figure.

NEW!



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LIGHTER WEIGHT! EASIER TO USE!

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- It's easier to handle and operate with the new balanced design.
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- More rugged . . . this new design produces a more stable ring gear assembly, which is less likely to spring or warp.
- Retains extreme accuracy of cuts, which all Mathey Pipe Beveling Machines are noted for.
- Available in all sizes, from No. 1 to No. 5 machines.

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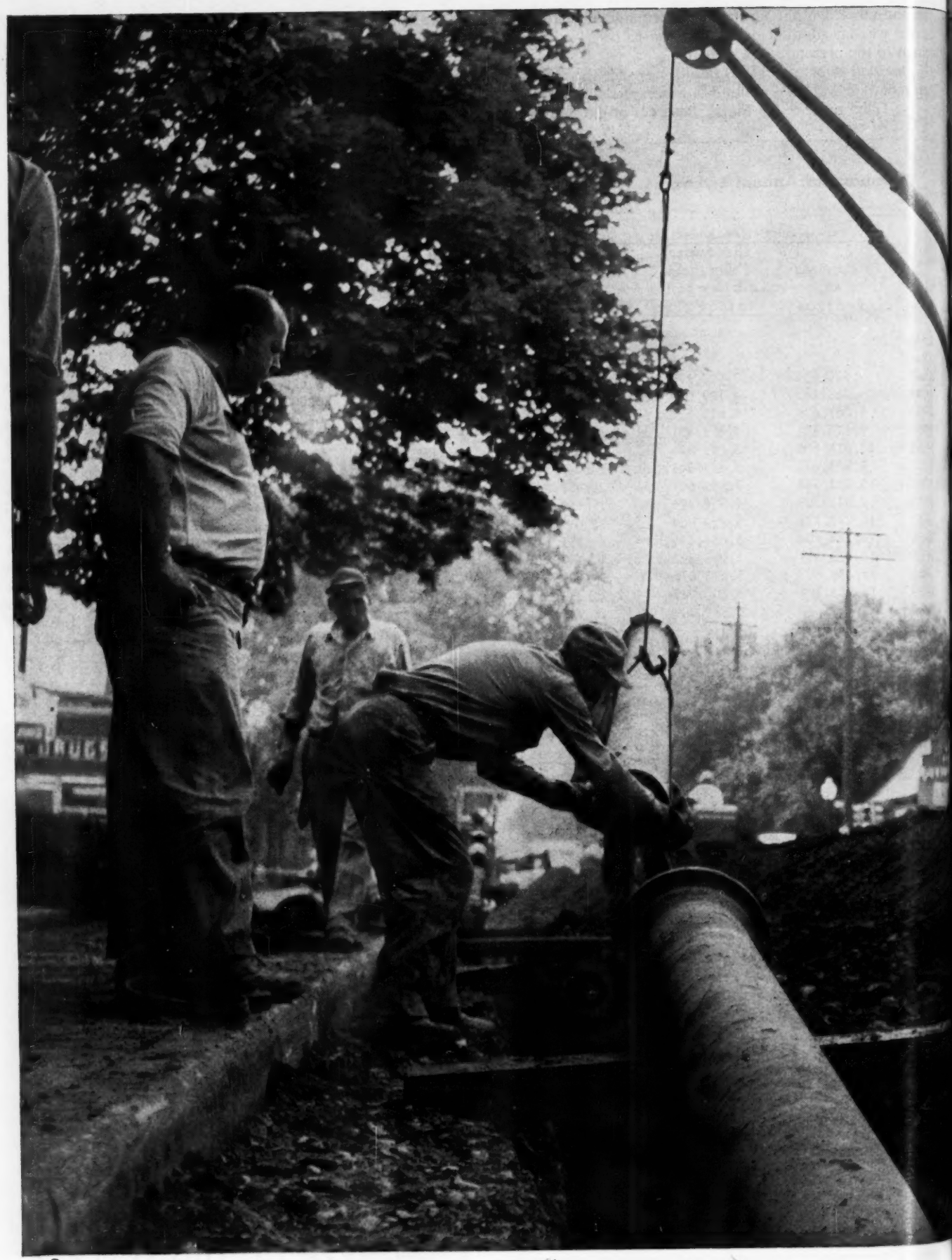


INSTALLATION IS A CINCH WHEN YOU CHOOSE CAST IRON PIPE

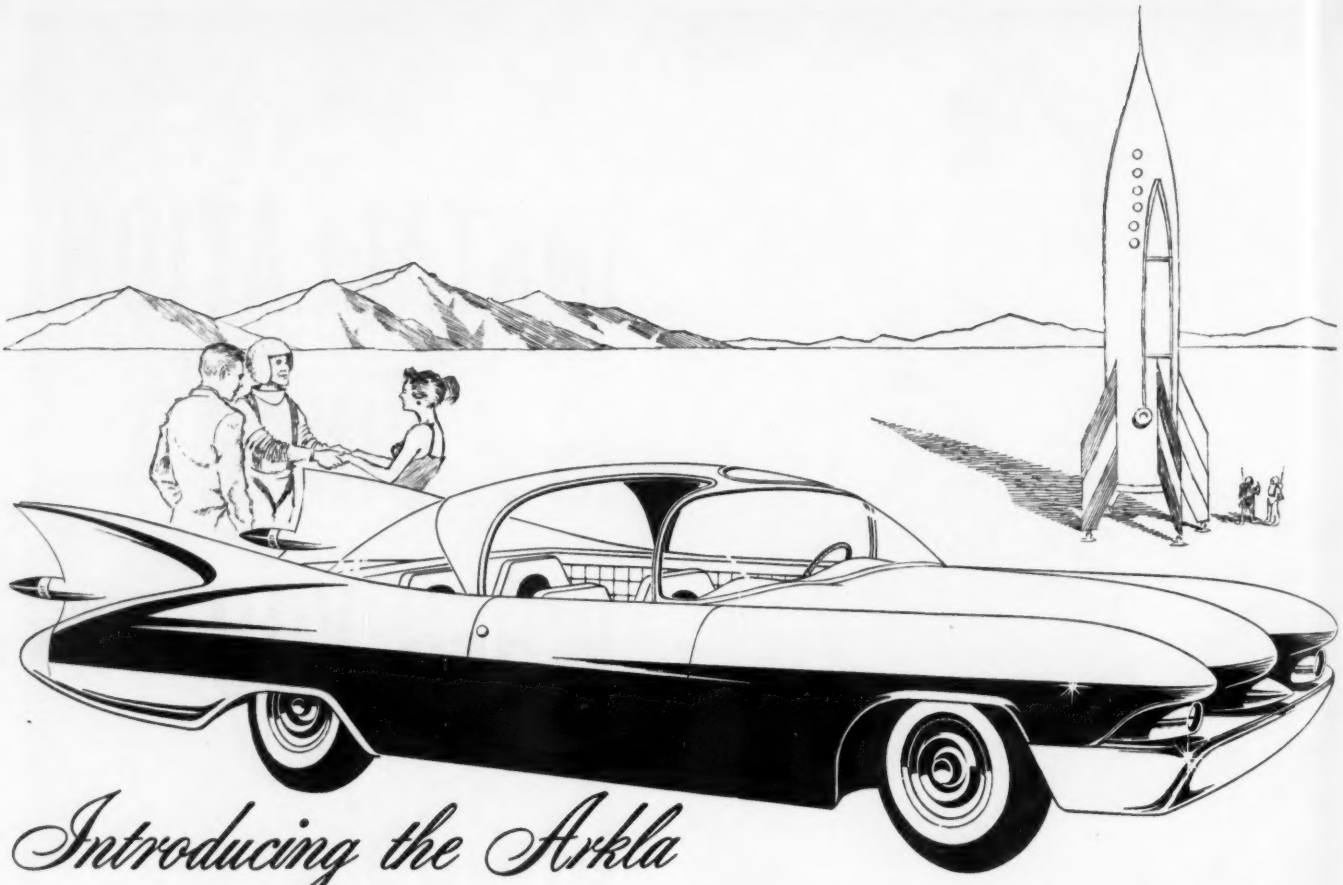
One of the reasons so many pipe experts prefer cast iron pipe is because it installs so easily—requires no coating or wrapping. As you see, the crew at the left is assembling the convenient lengths of cast iron pipe before trenching them—a particularly valuable time-saving operation when work crews must combat the handicap of wet trenches.

Besides being easy to handle, cast iron pipe is inherently rugged: it withstands all the usual stresses to which underground pipe is normally subjected; its modern mechanical joints remain tight under normal distribution pressures.

And tough cast iron pipe construction offers service-free dependability for years. Once in place, cast iron pipe stays there. In fact, 62 American cities are still using cast iron gas mains that were installed over a century ago.

CAST IRON PIPE RESEARCH ASSOCIATION,
Thos. F. Wolfe, Managing Director,
3440 Prudential Plaza, Chicago 1, Illinois

CAST IRON PIPE
THE MARK OF THE 100-YEAR PIPE



Introducing the Arkla

VAPORGLIDE

Arkla-Servel proudly announces a design and engineering vehicle which:

1. Gives ⅓rd more power without pistons or valves.
2. Provides lowest ownership cost... full 5-year warranty.
3. Is vibration-free... never needs a tune-up.
4. Has double and triple normal life expectancy, because there are no moving parts to wear out.
5. Won't lose capacity or jump operating costs with age, because it has no efficiency-robbing friction.

No, that's not a space age automobile... it's the Arkla-Servel Sun Valley All-Year gas air conditioner, as it compares to conventional electric central system air conditioners.

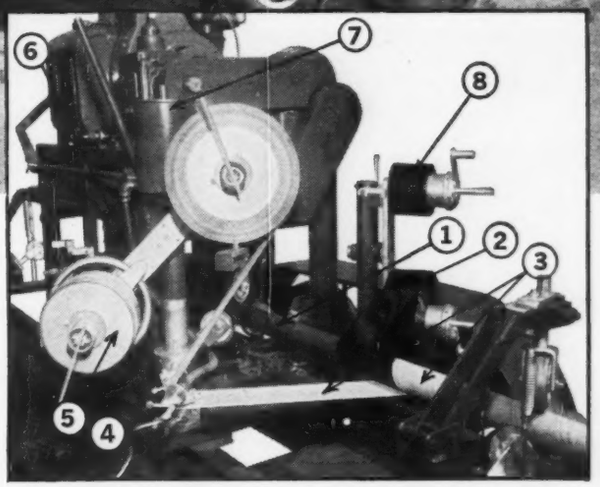
If we were really describing a new auto, you'd probably never buy anything but the Arkla model. That's what we think about modern Arkla gas air conditioning, too.

And, if you find the comparisons a bit hard to believe, we respectfully invite you to talk to your local gas company, or write Arkla Air Conditioning Corp.

ARKLA-Servel MAGIC GAS AIR CONDITIONING

ARKLA AIR CONDITIONING CORP • SHANNON BLDG. • LITTLE ROCK, ARK.

NEW TECHNIQUE ASSURES PERFECT ON-SITE COATING



Pipe (coming toward you) spins through machine . . . undergoes dynamic cleaning from twin-powered brush heads. Coating comes off brake-type tape drum. Outer wrapping runs through fast-gluing adhesive attachment.

1. Spinning pipe
2. Polyken tape coating
3. Outer wrap
4. Glue applicator
5. Stand-by outer wrap turret
6. Power brush heads
7. Glue tank
8. Stand-by tape turret

POLYKEN QUALITY PLUS UNIQUE APPLICATION METHOD MAKE TOP SITE-WRAP COMBINATION

Your protective coating results are only as good as the material you use and the way you put it on. And with Polyken tape . . . plus the special, new Polyken way of on-site application . . . you get a combination that really does a perfect job —*simply, speedily, economically.*

Simplicity? Right! The completely mobile machine sets up in an hour (knocks down in half that time), uses 6 men or less for continuous cleaning, coating, and wrapping. Speed? You can process up to 20,000 lineal feet a day, take 10-minute breaks to switch pipe sizes. Economy? Look at it this way: You get *quality* tape, properly applied by a high-speed *quality* process. The result can't help meaning more *dependable* coating for your dollar.

For the full story on both machine and tape, see your Polyken representative. It can mean maximum protection at minimum investment.

Polyken®

Experienced in modern PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

Super Gas Light Salesman Uses Portable Gas Light

Clyde Dains, *Oklahoma Natural Gas Company, Oklahoma City, Oklahoma*

No employee of Oklahoma Natural Gas Company has entered more wholeheartedly into its Gas Light Promotion program than George Skorkowsky, building operator of the Oklahoma City Service Center.

Since last August, George has sold and installed on ONG's lines more than 100 gas lights. In fact, he says, when those that he has now sold are installed, he will have some 125 in operation.

One of the early enthusiasts, George became so interested in promoting the sale of gas lights that he began assisting a local gas light dealer during evenings and weekends.

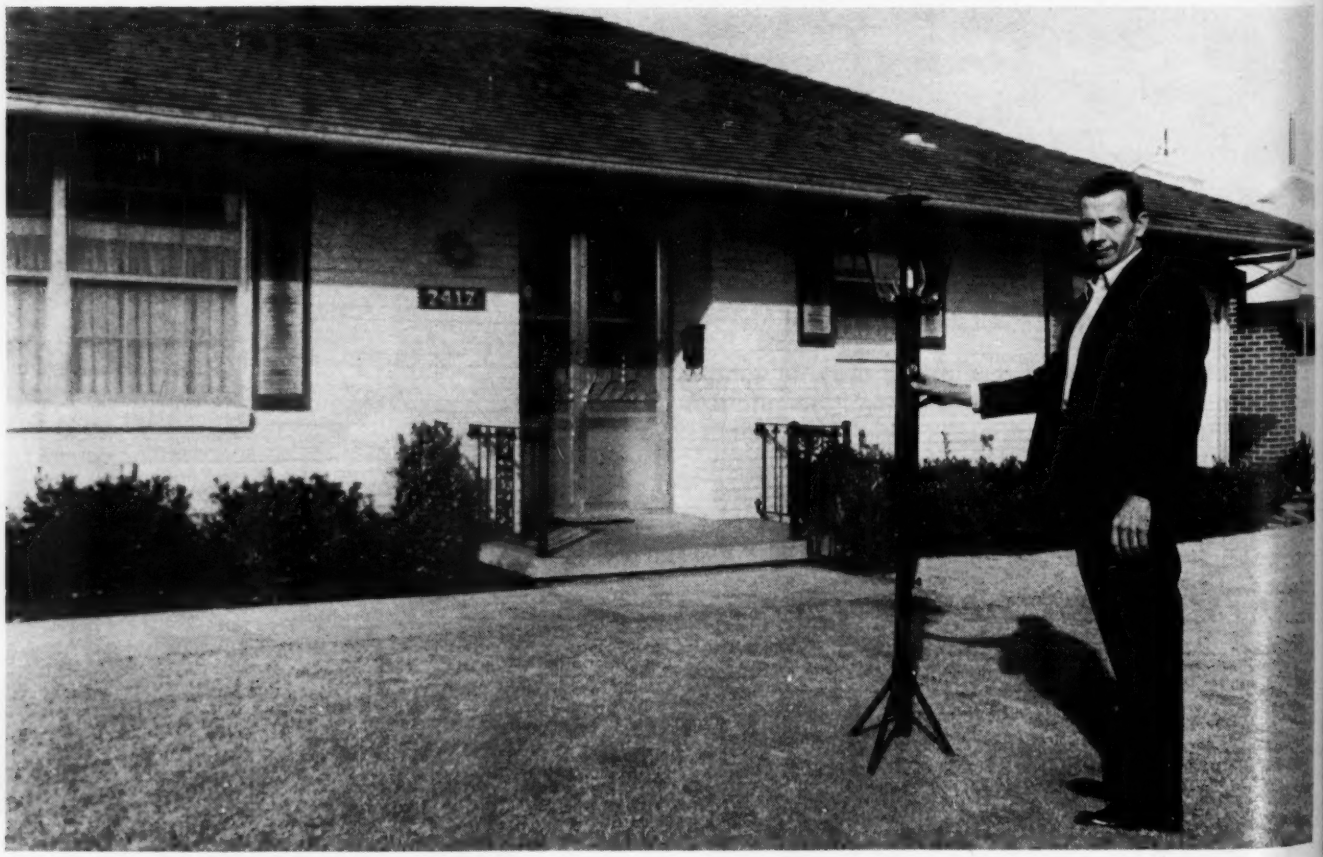
When the field opened up wider and he felt the program could be pushed harder on his part, George went into business for himself and sought the assistance of other employees who could see the possibilities for building ONG's revenue, if they got into the promotion more actively.

A firm believer in the salesmanship idea that nothing will sell an item more quickly than an actual demonstration, George has devised a gas light post bracket on the rear bumper of his car with a built in gas supply.

Driving along the residential street in the evening, George parks his car in front of a prospect's home, detaches the gas light post, and sets it up in the homeowner's yard on a short tripod stand. Then, when the customer comes to the door, George asks if that is where he would like to have his new gas light installed.

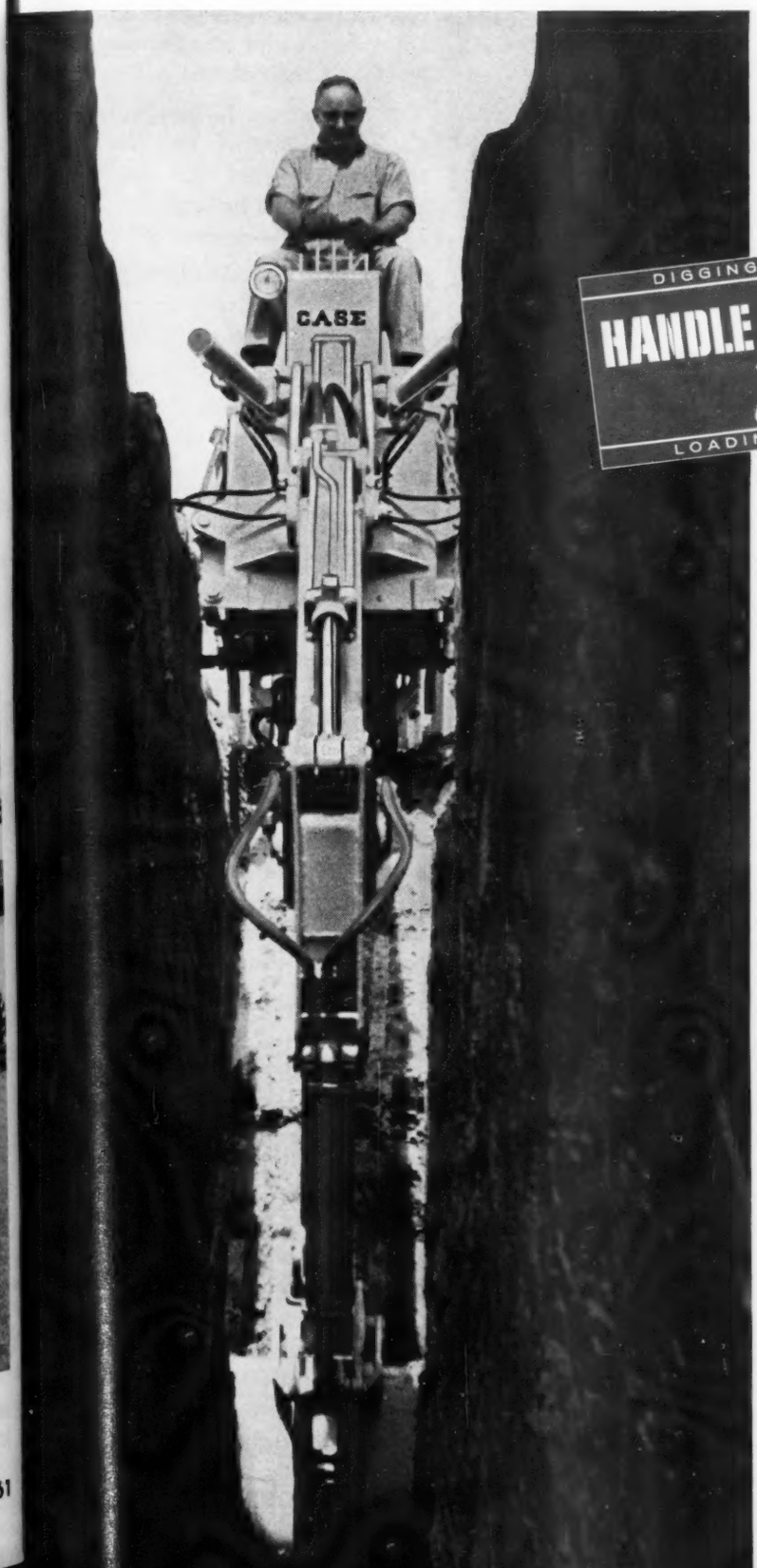
George declares he usually only has to make three calls on any customer. One to show the gas light, one to install it, and one return visit to check the setting and customer's approval.

He declares his goal is to install enough gas lights on ONG's line to pay his own salary. * * *



"Super gas light salesman" George Skorkowsky sets his portable gas light in a prospective customer's yard to provide a real life display to help clinch a sale. Skorkowsky, building operator for Oklahoma Natural Gas Company's service center in Oklahoma City, has sold more than 125 gas lights while working evenings and week ends.

How to get $1500 worth of EXTRA dig capacity FOR NOTHING



DIGGING • LIFTING

HANDLE WITH CASE

Utility

LOADING • CARRYING

You get two extra feet of backhoe digging depth *free* when you buy a Case 530 *Utility* Backhoe-Loader. This powerful 14′ digger costs no more than many competitive 12′ rigs (up to $1500 less than some 14′ units)... so the extra dig-capacity costs you *nothing*. With this larger-size Case digger, you not only get deeper dig-capacity, you also get more power for digging, more built-in strength, plus faster trenching and loader operation than other-make 14′ rigs. Here are some of the reasons why:

Fast, heavy-duty production machine. Case 530 backhoe cuts 14′ deep, excavates 18′ of trench 6′ deep from one position, digs extra bucketloads per hour because the smooth, uninterrupted 180° backhoe swing is foot-controlled... leaves operator's hands free to maneuver bucket and dipper stick. It's a husky digger with *highest-quality* features including stress-engineered *alloy steel* backhoe boom, dipper stick and buckets. The 2000-lb front-end loader applies 3700 lbs breakaway, digs heaped bucketloads fast, dumps with high clearance for quick back-up from high-sided trucks. Brawny tractor, powered by *high-torque Case-built diesel or gasoline engine*, maneuvers easily... turns short with power-steer... reverses instantly with shuttle-shift ...drives anywhere at speeds to 18 mph.

Try 530 on your work. Find out how you can increase your trench capacity and productive output *at no extra cost*. Call your Case Dealer now for a free demonstration. Or write J. I. Case Co., Racine, Wis., Dept D1731 for complete information. CU-BL-263

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Report on Modern Pipelining...

318 IS TODAY'S MOST ADVANCED PIPELINER

Built by the world's pioneer in mechanical ditchers, and backed by 68 years of experience in ditcher engineering, the Gar Wood-Buckeye 318 is a breakthrough for pipeliners—the most modern and most rugged tool ever designed for pipeline ditching.

The 318 is the only production ditcher equipped with a torque converter... the first large-capacity pipeliner compact enough to be transported on a standard low-boy... the first with a tail-shaft governed power train.

Efficiency is the hallmark of this continental pipeline ditcher—efficiency through Gar Wood-Buckeye's years of engineering experience in hydraulics, power conversion, and the overall design of especially reliable construction machinery.

TWO 318's BOOST PRODUCTION 30%, CUT COSTS 15% ON TEXAS PIPELINE

A Texas contractor is breaking all records for economy while ditching a 160-mile pipeline near Dumas, Texas, for the Shamrock Oil & Gas Corp.

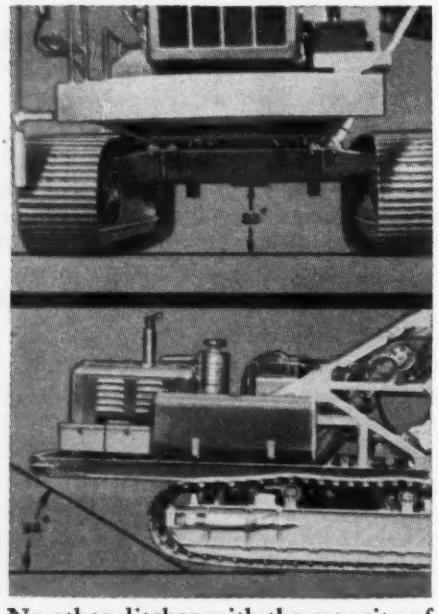
The Vaughn & Taylor Construction Co. of Odessa, using two Gar Wood-Buckeye 318's, has increased production by 30%, cut fuel costs in half, and reduced operating costs 15%.

"This is the best ditcher for pipeline work that I've ever handled in my 39 years of work," said general manager, D. D. Vaughn.

"We haven't had to touch a wrench to our machines, and already we've dug 40,000 feet of ditch and moved 32,000 cubic yards of dirt. There's no question about it—two 318's will do more work than any other three machines put together."

Vaughn reports that both the performance and operating economy of the Gar Wood-Buckeye 318 are made possible by its exclusive Torqmatic Converter Drive, matched to Gar Wood-Buckeye's modern power train and advanced hydraulic systems. These features speed up work and cut costs for pipeliners, and make the Gar Wood-Buckeye 318, the most efficient piece of equipment ever developed for pipeline ditching.

318 PIPELINER OFFERS EASIER TRANSPORT, BETTER CLEARANCE THAN ANY PIPELINE DITCHER



No other ditcher with the capacity of the Gar Wood-Buckeye 318 is so compact, so mobile. It is the only ditcher in its class that can be loaded and transported on a standard low-boy. And with the center of gravity located *ahead* of the rear crawler mounting axle, there is no dangerous weight-shift, no chance for damage as the 318 is loaded for transport.

The 318's high, 23" clearance, with no exposed "plumbing" underneath, keeps the machine on the right-of-way, with no detours for ordinary obstructions.

Combined with this clearance, the 318's high approach angle—a full 22°—gets the machine where it has to go. Rough terrain steep banks and stream crossings are easily negotiated. And the high approach angle also facilitates trailer loading.

Whether on the job or on the road, the Gar Wood-Buckeye 318 is designed to protect *itself* from damage. No other pipeline ditcher combines such simplicity of design with so much ruggedness—one reason why the 318 is the best spearhead for *any* pipeline job, the standout in any spread.

TORQMATIC DRIVE REDUCES FUEL, MAINTENANCE COSTS

Optimum engine efficiency—the kind that saves, literally, thousands of fuel and maintenance dollars—is made possible by the Torqmatic Converter Drive of the Gar Wood-Buckeye 318.

This drive multiplies engine torque *as it is needed*, without harmful engine lugging and stalling. Because the engine works easier, maintenance and fuel costs are greatly reduced.

GAR WOOD-BUCKEYE 318

Revolutionary Torqmatic Drive Enables 318 to Dig 1500 Feet an Hour on North Dakota Pipeline Job

A new record in pipeline ditching—1500 feet per hour, 15,000 per day—is being set in the Northwest by a Gar Wood - Buckeye 318 Pipeliner.

The job is a big one—187 miles through craggy Montana foothills, under the Missouri River, and across the prairies of North Dakota. The 8" line is being laid by Curran Construction Ltd. of Edmonton, Alberta, Canada, for the Farmers Union Central Exchange of Minneapolis, a co-op organization.

One main reason for the 318's remarkable rate, through rock, shale, and over steep grades, is its revolutionary Torqmatic Converter Drive. This drive was recently developed by Gar Wood - Buckeye to deliver the required torque, *automatically*, regardless of soil conditions. No other ditcher has it.

With Torqmatic Converter Drive, a tail shaft governor adjusts engine rpm's to maintain a constant output shaft speed as the sub-soil changes in density and weight. At the same split second, the torque converter changes torque to meet the changed work load. A fast, constant digging pace is maintained, and the operator need never change gears or adjust the throttle. Some added results: More rpm's, a resultant savings in fuel, plus much more power at the digging wheel.

The power, speed, and economy that Curran Construction is getting from its Gar Wood-Buckeye is typical of the machine's performance in any cross-country spread. And it is proof of Gar Wood-Buckeye's claim: The 318 Pipeliner gives you more production than any other pipeline ditcher.

CURRAN'S 318 TAKES 45° GRADES WITHOUT TOW TRACTOR

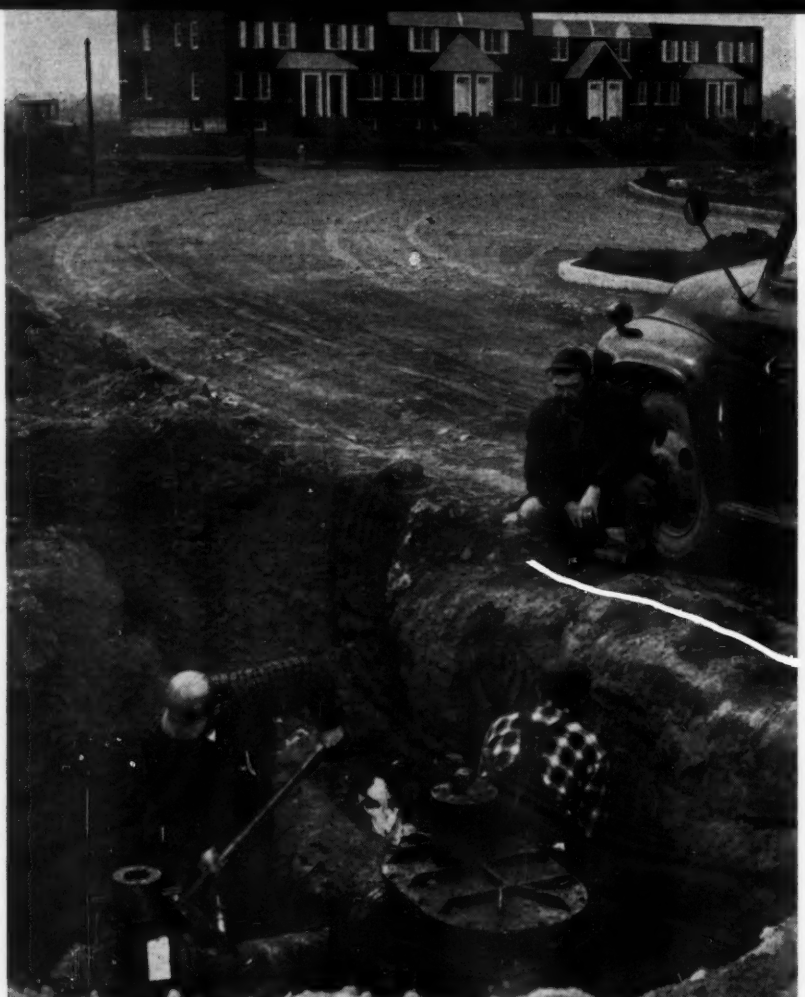
Ditching through the steep Montana foothills has been accomplished by a Gar Wood-Buckeye 318 without the aid of a tow tractor, according to Ditch Foreman George Roberts of Curran Construction Ltd. Roberts is supervising ditching for the 187-mile pipeline from Glendive, Montana to Minot, North Dakota.

Roberts reports that grades up to 45° have been encountered, but a tow tractor has never been needed. "The Gar Wood 318 will climb as steep a grade while digging as any crawler-mounted tractor," he said.

The exclusive, specially designed power train of the Gar Wood-Buckeye 318 is the main factor behind the machine's performance on hills. Every component—engine transmission, two-speed excavator differential, "Hi-Lo" traction transmission and all drive units—are designed specifically for heavy-duty pipeline service. Unlike other ditchers, there is no "adapted" equipment in this smooth-working, high-speed power train.

GAR WOOD INDUSTRIES, INC.

Wayne, Michigan • Findlay, Ohio



● **Down in the bellhole,** Philadelphia Electric crew members install a to-be-buried valve on a 16-in. main recently constructed to serve a new 1000-house development in company's Delaware division. David Farraday, far right, checks progress of the installation.

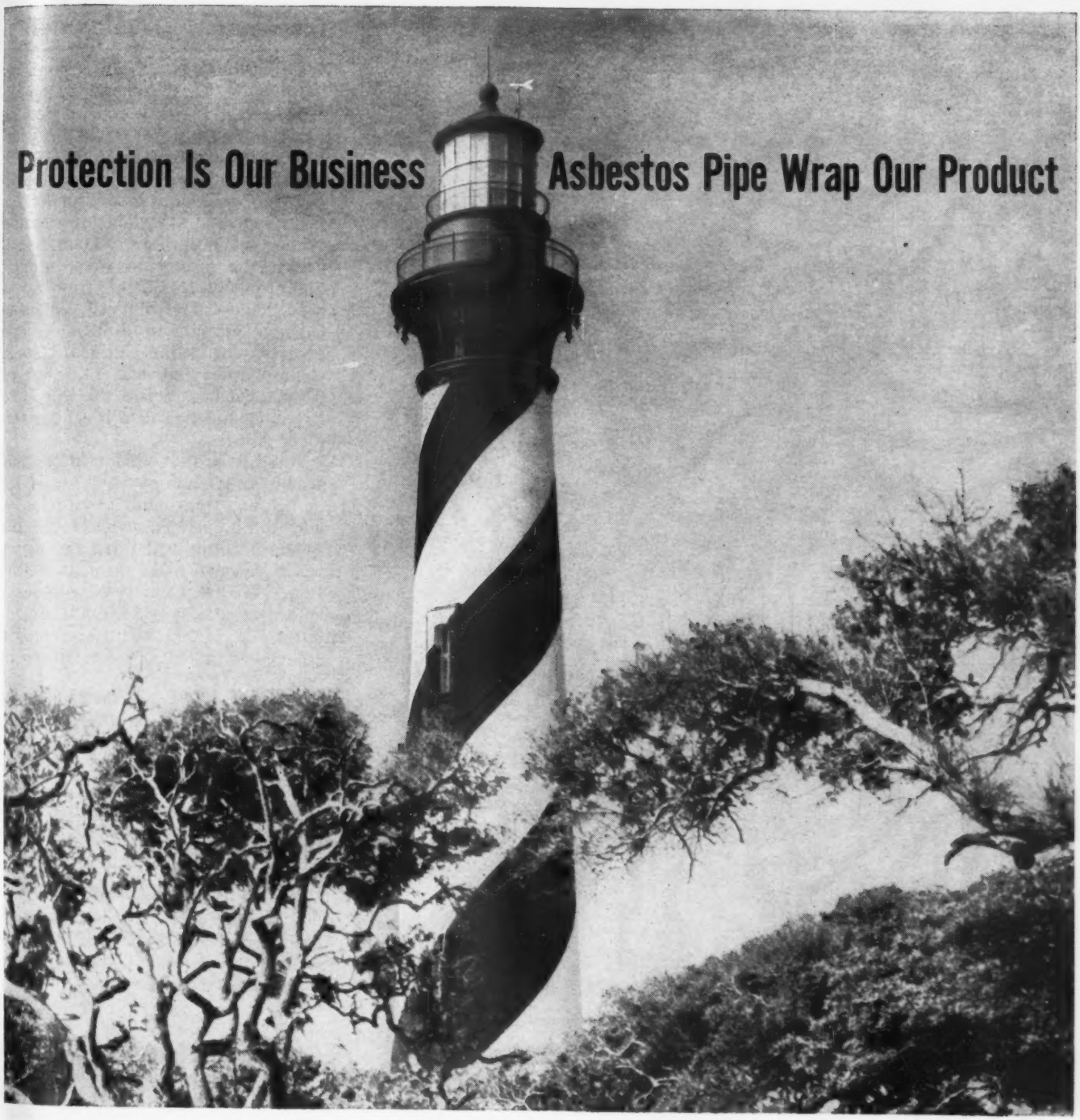
Distribution Developments

NEWS ABOUT CURRENT AND PLANNED CONSTRUCTION

Philadelphia Electric Company, Philadelphia, Pennsylvania, plans to spend approximately $3,322,000 in 1961 for construction of mains and services to serve new customers in the 4-county area surrounding Philadelphia. An estimated 60% of this work will be done on PE's high pressure distribution system and the remaining 40% on the medium and low pressure distribution systems. Approximately $2,800,000 additional is expected to be spent for renewal of facilities, renewals in advance of highway construction, cathodic protection, and system reinforcements.

Delaware Power & Light Company, Wilmington, Delaware, has budgeted approximately $2,907,800 for additions and improvements to its gas distribution properties. Bulk of the sum, $1,260,900 is allocated for installation of 285,120 ft of 1¼ thru 12-in. new and replacement mains. Another $527,800 is tabbed for 242,880 ft of ¾ thru 2-in. new and replacement services; $198,200 for domestic meters; $86,500 for house regulators; and $58,600 for other meter and regulator equipment. Delaware also plans to construct a 100,000 Mcf per hour propane-air gas plant at an estimated cost of $773,800. The proposed plant will be tied-in with Sun Oil Company's LPG mined underground storage cavern at Marcus Hook, Pennsylvania, and connected to Delaware's system at Claymont, Delaware.

Working in an entirely new community going up in Philadelphia Electric Company's Delaware division, construction crew members, left to right, Joseph Pirri, Alvin Terrell, and Herbert Zahn prepare gas service lines on a new street of new homes. Careful timing here assured gas service for the entire development before streets were paved and the first home completed.



Through complete Quality Control—Nicolet Asbestos Pipe Line Felts have received universal acceptance for their uniformity and absolute dependability. ■ Whether your pipe line requirements demand Nicolet Asbestos #15 "Standard", #8 "Tufbestos" or #10 "Reflecto" (the new, improved, white Asbestos Felt) you are assured of getting the best protection obtainable. ■ And now—the addition of "Old Nic" Glass Wrap to this family of Pipe Wrap products makes Nicolet your best source for complete pipe line protection. ■ "Old Nic" Glass Wrap has uniform porosity which allows hot tar or asphalt enamel to bleed through, while letting hot gas escape, minimizing "holidays". "Old Nic" Glass Wrap will most effectively protect yard wrapped pipe against impact damage. It is equally effective in over-the-ditch operations. ■ **Write today for full specifications and samples of Nicolet pipe protection products.**

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NICOLET INDUSTRIES, INC.

FLORHAM PARK, NEW JERSEY

"For want of a nail a shoe was lost, for want of a shoe a horse was lost, for want of a horse a soldier was lost, for want of a soldier a battle was lost, for want of a battle a kingdom was lost—and all for want of a nail."

FOR WANT OF A NAIL

Mounting unaccounted-for, like the lost nail, can play havoc with the success of a company. Southern Cross Foresters in featuring "Contract Leakage Control Service" makes possible extremely close leakage control, both survey and repair, at realistic savings for gas distribution systems. On a contract basis we deliver fully-trained help when you need it . . . as you need it . . . without costly build-up of personnel and equipment. Call us collect for complete information.

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Distribution Developments

Washington Gas Light Company, Washington, D. C., plans to step up expenditures for new construction to a new record of $18,000,000 this year. Biggest single project is 16 mile 24-in. main crossing the Potomac River south of Alexandria that will connect WGL's Maryland and Virginia distribution systems at a cost of $3,770,000. Specifically, the project involves installation of 69,000 ft of 24-in. from Lockheed Boulevard, Hybla Valley, Fairfax County, Virginia to Branch Avenue and Naylor Road, Prince George County, Maryland, and 13,000 ft of 24-in. dual lines across the Potomac River. Completion date is set for October, 1961.

Another project scheduled for this year is installation of 58,000 ft of 16-in. belt line (maximum 35 psi initially, later to be operated at maximum 250 psi) from Greenbelt Road and Kenilworth Avenue, to Lanham, to Belair, Prince George County, Maryland, at an estimated cost of $371,000. An additional $725,000 will be spent for 109,000 ft of various size mains in Belair.

In a $37,200 project in Kemp Mill Estates, Montgomery County, Md., WGL plans to install 905 ft of 6-in.; 7810 ft of 4-in., and 1705 ft of 2-in. mains with work to be completed in August. Another $55,600 has been allocated for installation of 3110 ft of 8-in. 8365 ft of 2-in. distribution main in Westmore subdivision, Fairfax County, Va. Work is underway. Another $90,600 will be spent for installation of 5795 ft of 12-in., 3475 ft of 6-in., and 1230 ft of 4-in., and 5045 ft of 2-in. in Marumsco Hills, Prince William County, Va.

Interstate Power Company, Dubuque, Iowa, plans to convert to natural gas in Savanna, Illinois, (pop. 4950) and late in February asked for FPC okay of a 1.1 mile line crossing the Mississippi River to complete connection of the already-approved Northern Natural Gas Co. 19-mile 8-in. supply lateral. Total cost of the new project is estimated at $308,090 and includes $151,150 for cost of the 1.1 mile 8-in. river crossing and installation of the measuring station on the Iowa side of the Mississippi River, and $156,940 for expansion of the Savanna distribution system. (Interstate is also paying Northern $227,293 of the cost of the 19-mile 8-in. lateral.) Expansion of the distribution system involves installation of 19,000 ft of 4-in. ($61,750), 14,000 ft of 2-in., ($31,250) and an undetermined number of services ($39,480). Other costs account for the remaining $7500.

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Robertshaw TLC* dryer control does for the laundry what automatic cooking has done for the kitchen!

Robertshaw's TLC* dryer control automatically determines evaporation taking place by measuring temperature drop of air passing through wet clothes ... calculates with extreme accuracy the amount of drying required for any size load, any fabric, any mix. Temperature is gradually reduced as clothes approach desired dryness. When set dryness is reached, heat is turned off for gentle fan-cooling.

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- TLC drying temperatures safe for all fabrics . . . any mix
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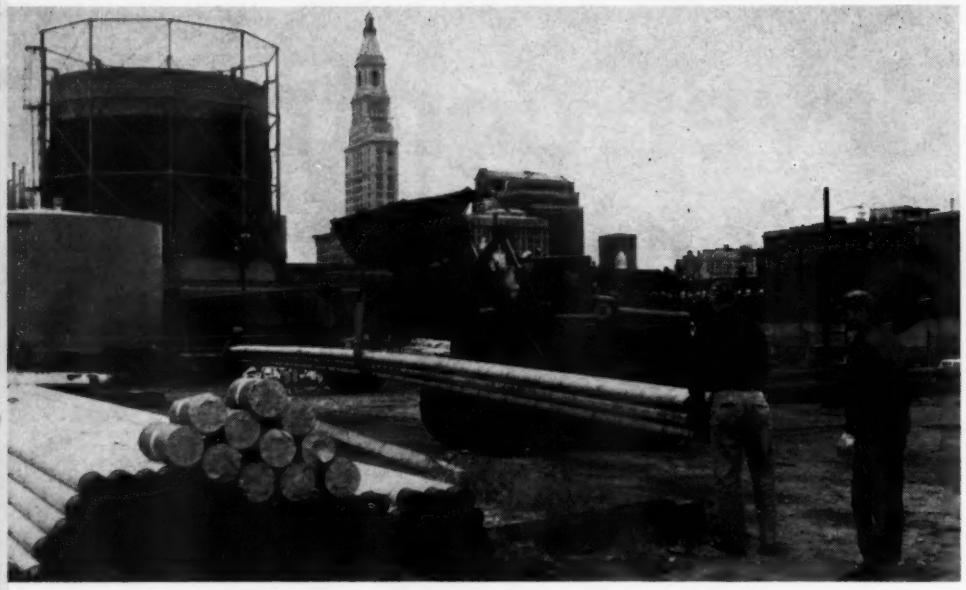

Hartford Gas Company uses its tractor-shovel unit also as a pipe handling crane. The "Payloader" unit equipped with a Drott 4-in-1 bucket is used to load out 50-ft lengths of 4-in. precoated pipe — five at a time — in company's equipment storage area.

Minneapolis Gas Company, Minneapolis, Minnesota, has budgeted approximately $5,750,000 for 1961 construction. Major items include $1,250,000 for refrigerated propane storage, and $3,300,000 for expansion of the distribution system. Another $836,000 has been tabbed for a new service and distribution building, a new research building, and for the purchase of cars and equipment. During 1961, approximately 450,000 ft of new mains and 5300 new services will be installed. Company plans to replace approximately 7100 services and rehabilitate 18 miles of existing main. Customers are expected to increase by 5000.

Construction on the refrigerated propane storage plant is well underway; concrete has been poured for the tank at Dakota Station, and Chicago Bridge and Iron Co. started erection of the steel work late in January. The plant is expected to be ready for operation by June 1. Also, foundations have been poured at the Dakota Station for ten 30,000-gal tanks that will be moved from Tyler and Broadway in Minneapolis. Number Two holder (Northeast) will be demolished at the end of the heating season.

Hughesville Division of Jersey Shore Gas and Heating Company, Jersey Shore, Pennsylvania, plans to build a distribution system in the Boroughs of Hughesville and Picture Rocks to serve the area and has asked the FPC to direct Transcontinental to establish a connection at a point near Picture Rocks. Total cost is estimated at $144,960 with $1,800 for the interconnection, $32,530 for 16,000 ft of 2-in. supply line; $2500 for the regulator station, and $72,900 for 27,000 ft of 2-in. in the distribution system, and $35,230 for other costs.

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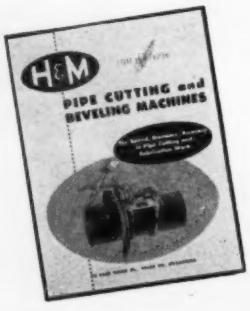

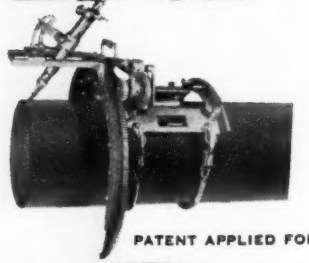

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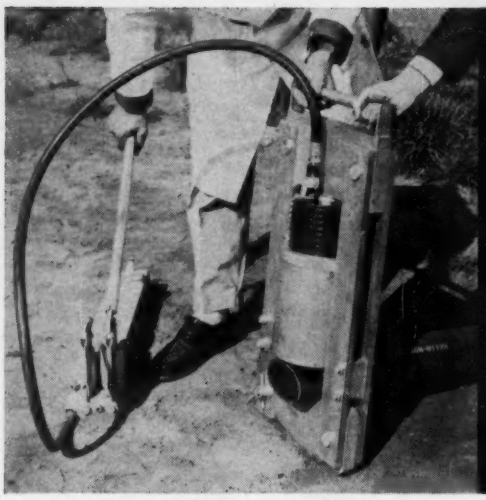

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COMBINES HIGH EFFICIENCY WITH MINIMUM WEIGHT

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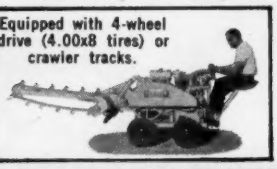
W-I POW-R-DITCHER
Digs Up to 8" Wide . . . All-Hydraulic Ground Travel

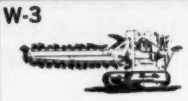
The new Model W-1 Pow-R-Ditcher is the "baby" of the expanding Vermeer Ditcher line. An ideal unit for contractors, utilities, custom operators and plumbers installing shallow service lines. The W-1 features all-hydraulic ground travel regardless of digging or transport speeds. The boom is also raised and lowered hydraulically. This is a powerful, rugged small trencher that "can really take it". Powered by a 9 hp. Wisconsin AENL engine. Gives maximum ground traction even under most rugged digging conditions. Ask for a demonstration.

Equipped with 4-wheel drive (4.00x8 tires) or crawler tracks.



PICK THE POW-R-DITCHER TO FIT YOUR NEEDS

524T

W-3


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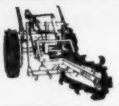

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Distribution Developments

Consolidated Edison Co. of New York, Inc., New York City, plans to spend approximately $6,200,000 for additions and improvements to its gas distribution properties. This budget compares with $8,000,000 spent in 1959 and $5,500,000 spent in 1960.

Town of Liberty, Mississippi, wants to install a new $275,000 distribution system and has asked the FPC for an order directing Transcontinental Gas Pipe Line Corp. to establish connection of its transmission lines with facilities to be installed by the Town of Liberty. Project includes an 82,000 ft, 3-in. supply line (estimated to cost $102,500) that will tap Transco's existing line on State Road 584, 0.6 miles east of the village of Gillsburg. Distribution system proper, estimated to cost $107,025, will involve installation of 2200 ft of 4-in., 17,000 ft of 2-in., and 56,000 ft of ¾ to 1½-in. mains and services. Approximately 409 meters will be connected. Other items entering in the total bond issue request of $275,000 are engineering, legal and administration, $24,750; contingencies, $10,474; and escrowed interest, $30,250. Pan American Engineers of Baton Rouge, Louisiana is engineering firm for the project.

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S-1500...FITTING COMPANION FOR THE EVERETT 2000 SERIES...

Digging depth to 42", width 12" standard. Up to 18" width in 2" increments by use of bucket extensions. Speed up to 600' per hour with Everett reduction transmission. Cuts trenching costs. Send for information.

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Distribution Developments

Union Light, Heat and Power Co., Cincinnati, Ohio, has work underway on its new million dollar mined gas storage cavern *(see AGJ Feb. 61)* located beneath a steep hillside off Amsterdam Pike in Kenton County near Constance, about one-half mile south of the Ohio River. Part of a $3,000,000 gas service improvement program, the new cavern will be used to store approximately 7.5 million gal of liquid propane for use in supplementing the gas supply of Cincinnati Gas and Electric Co., parent company, and Union Light. Second phase of the improvement program is construction of a $2,000,000 propane-air-gas plant about 2.5 miles south of the cavern near Erlanger. The plant will process liquid propane supplied from cavern and supplement the area's gas supply by as much as 50,000,000 cu ft per day. An 8-in. line will be installed to carry liquid propane from cavern to the propane-air plant. The new cavern, similar to one installed and being used by CG&E near Middletown, Ohio, will be of multi-room design, and will measure about 180 by 330 ft with 30 ft ceilings. Tunnels connecting rooms will be 30 by 30 ft, and supporting pillars will measure 40 by 40 ft.

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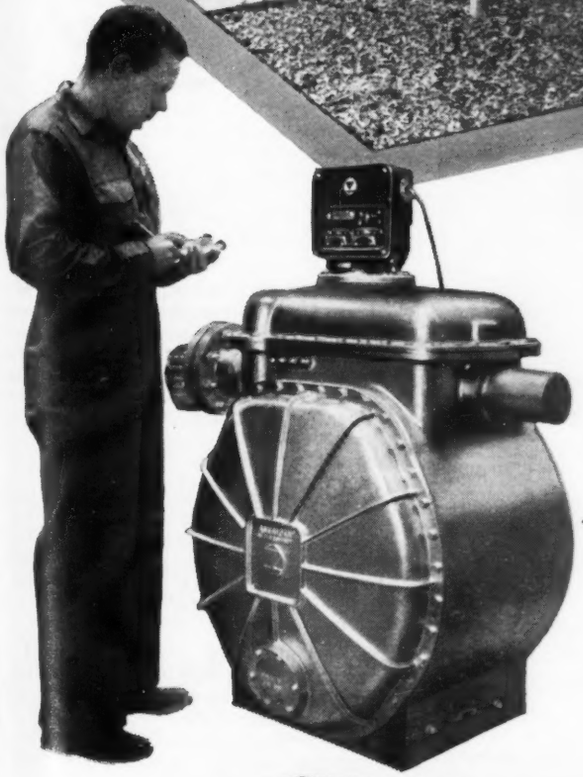
...at city gate stations



AMERICAN® 500B Ironcase Meters provide positive displacement measurement accuracy and dependability at this Granite State Transmission Company take-off station. High capacity Ironcase Meters provide accurate measurement under all conditions. Molded, 3-convolution Duramic diaphragms and other American quality features assure the economical and dependable handling for the big loads...with sustained accuracy at lowest cost. Capacities to 10,000 cfh. Working pressures to 250 psi in rugged Ironcase and to 100 psi in light weight Aluminumcase Meters.

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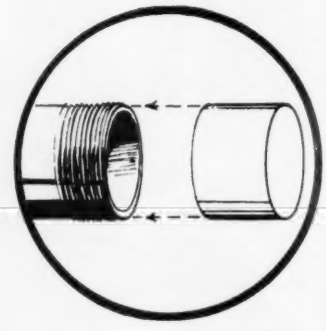
MATERIALS • EQUIPMENT • SERVICES

Snoop, a new liquid leak detector available from Nuclear Products Co., has a fine bubbling action that detects leaks in pressurized gas lines. Thin, solid stream is applied to test each connection; bubbles form immediately if leak is present. Solid stream method of application avoids bubble formation from spraying caused in previous products. Comes in 8-oz polyethylene squeeze bottle with "snooper" tube that is adjustable from ½- to 12-in. lengths. 1

New easy-to-clean consumer gas line filter . . . designed to prevent clogging of furnace and appliance pilots by eliminating dirt, pipe scale or other foreign matter from natural gas lines . . . is now available from Air-Maze Division of Rockwell-Standard Corp. New filter is available in ¾ and 1-in. sizes with female threaded inlet and out. Maximum safe operating pressure is 125 psi. At rated capacity, initial pressure drop through filter is approximately 1-in. of water. Unit can be cleaned without breaking the line — one bolt loosens the two aluminum sections, and the filter element can be washed in plain water and detergent. No special solvents, vacuum cleaning or compressed air is required. 2

A New Decade for New Products . . . In the next 10 years, the gas industry, it is estimated, will spend more on research and development than in its previous 144 years of existence. *What will these advances in technology mean to you?* To keep you in touch, we review each month the more outstanding new developments as they appear. You can get additional information just by circling . . . *on the reader reply card in this issue* . . . the numbers appearing at the end of each item.



Polycaps . . . plastic protective caps to protect pipe threads . . . are available from Armor Plastics of Culver City, California, for ¾- and ½-in. pipe. Standard colors are red, white, or blue. Caps are made of heat resistant polytheline plastic. 3

Gas measuring and mixing equipment . . . thermeter, calorimixer, and caloroptic lines . . . are described in three new publications from Cutler-Hammer Inc. All three brochures are fully illustrated and, except for the caloroptic bulletin, contain dimensional drawings and electrical ratings. 4

Adams full-seal broken pipe repair clamps are described in new 8-page booklet just issued by the manufacturer. Data includes pipe size chart, clamp size chart, exploded view with full description of parts, and a complete price list for all sizes. 5

New plant safety system developed by North American Mfg. Co. for plants using gas is described extensively in new supplemental bulletin. Safety shutoff valves and supervising gas cocks afford two-way plant protection and are considered the mainsprings of the new safety system. 6

Hydraulic shoring device . . . called Saf-T-Jax . . . is described in new bulletin from Sigma Engineering Co. Unit provides faster, safer trench bracing, and is said to eliminate danger from trench cave-in. Unit will shore trenches from 20 to 27 in. wide or up to 72-in. using extension rods. Supports are made of aluminum, and are both corrosion resistant and lightweight — only 50 lb. One man can install shoring supports from the top of the trench by merely positioning plates against trench sides and actuating both jacks by means of a hydraulic pump. 7

STRAIGHT LINE PAN MOVEMENT

it's easy with this Improved Lancaster carrier wire assembly

2 NEW Lancaster FEATURES FOR INCREASING GAS METER ACCURACY

There's no chance for a diaphragm pan to start traveling in an arc when you install this improved Lancaster Carrier Wire Assembly.

SIDE CARRIER BRACKET **height can be quickly adjusted for most accurate positioning. No wire bending.**

OVAL SLOT CENTER BRACKET **permits diaphragm pan to travel straight through. No chance for wear.**

Oval slot center brackets available separately can be adapted to any carrier wire. Porous bronze and graphite bushings used throughout. Order now for easier installation and increased meter accuracy.

A meter is only as accurate as its parts . . . and Lancaster quality parts are guaranteed to outperform the original parts.

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How's Your AQ? (That is, your Abbreviation Quotient). How would you abbreviate "250 degrees Fahrenheit" in a technical report? There are five different styles in use. Results of a survey conducted by Greif-Associates, Inc., indicated technical term had at least two variations and one of them — 10 ft per sec per sec — was handled in 8 different ways. Copy of survey covering the use of 23 commonly-encountered abbreviations is available free. **8**

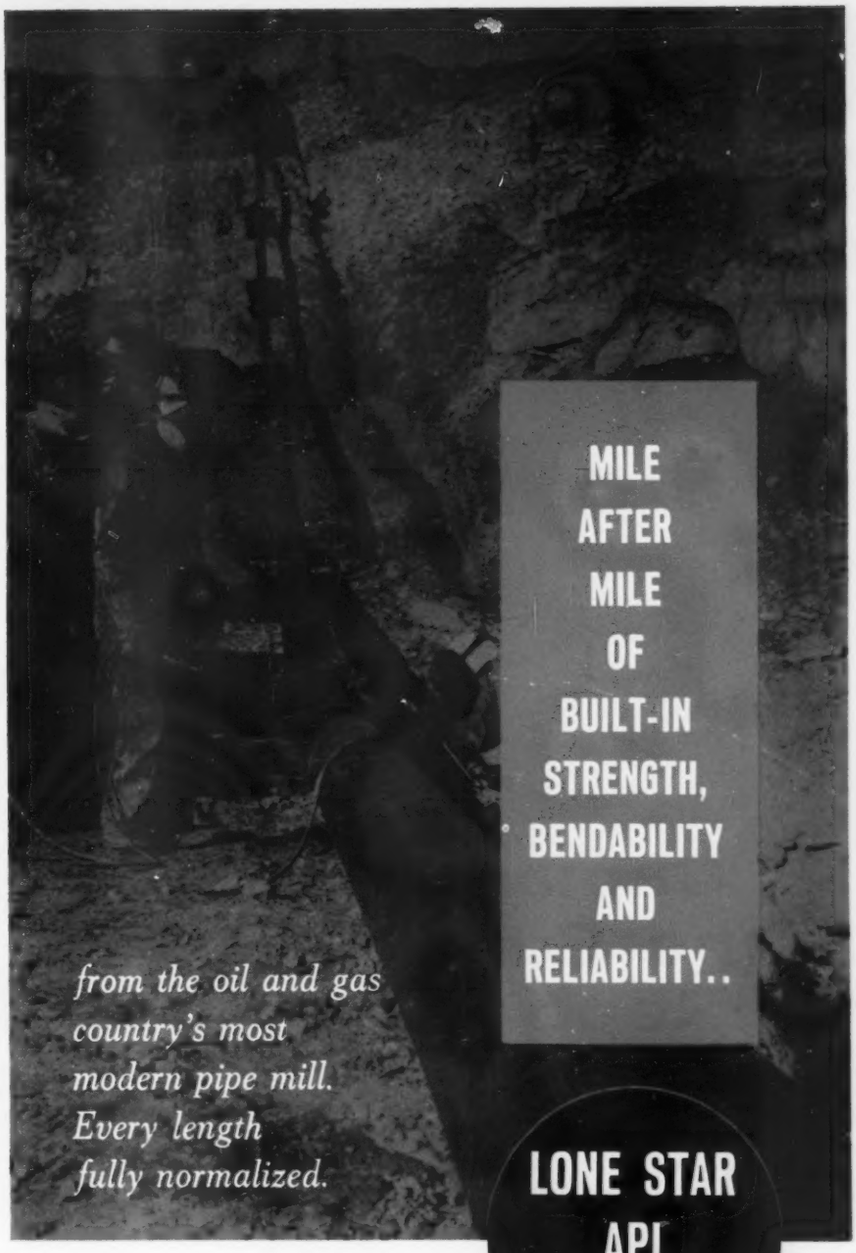
Of interest to utilization engineers . . . Automatic motorized, mechanical-draft gas burners built by Mettler Co., Inc., incorporate the "building-block" principle of component design. Burners feature a selection of 6 burner sizes in 15 burner assembly variations, providing capacities to 35,000,000 Btu/h. This wide variety of capacities available in the numerous assemblies enable user to specify burners to meet virtually any firing requirement, as well as meet FM, FIA, and other code requirements and regulations. Burners are of inshot type. Standard interchangeable parts include 4 different valve-manifold assemblies, 7 control cabinet arrangements, and 3 optional oil assemblies for stand-by fuel firing. Also there are 4 auxiliary manifold assemblies to meet special insurance requirements. **9**

Gas detector . . . from Houston Instrument Corp. . . . . provides central control housing for multi-point monitoring of presence of hazardous, combustible gases. Sensing elements located at various points detect gas and relay information to central unit by cables up to 1500 ft long. Each detection point has its own measuring circuit, indicator, and adjustable alarm. Gas concentration is read directly in terms of percent of lower explosion limit of the hazardous gas; should it exceed a safe value, both alarm and shut-down circuitry is triggered. **10**

Ever wish you could get your mail answered faster? Prompt answering of letters — especially internal correspondence and memos — is all but guaranteed with new correspondence form called "letter-gram." Form combines best features of a letter and a telegram, and is designed to cut clerical costs, speed outgoing correspondence, and bring faster replies. Each Letter-Gram set includes snap-out letter form, an outgoing window envelope and a reply window envelope. Snap-out letter form provides original, a followup copy and a copy for recipient's files. Free sample available. **11**

Chronoflo telemetering equipment and systems is the subject of new 8-page bulletin from B-I-F Industries. Basics of transmitter and receiver operation in a time-duration impulse system are included. Also pictured and described are Chronoflo transmitters, receivers, and accessories. **12**

New instrument . . . that accurately indicates changes in flame characteristics caused by variations in gas-fuel supply and air/gas mixture . . . has been announced by Selas Corp. of America. Of interest in industrial heating operations where heat transfer rate must be maintained to meet exacting time-temperature cycles. New unit is sensitive to any variation, detects and indicates changes as little as 5 Btu in fuel gas and 0.5% air in air/gas mixture, in 5 seconds. **13**



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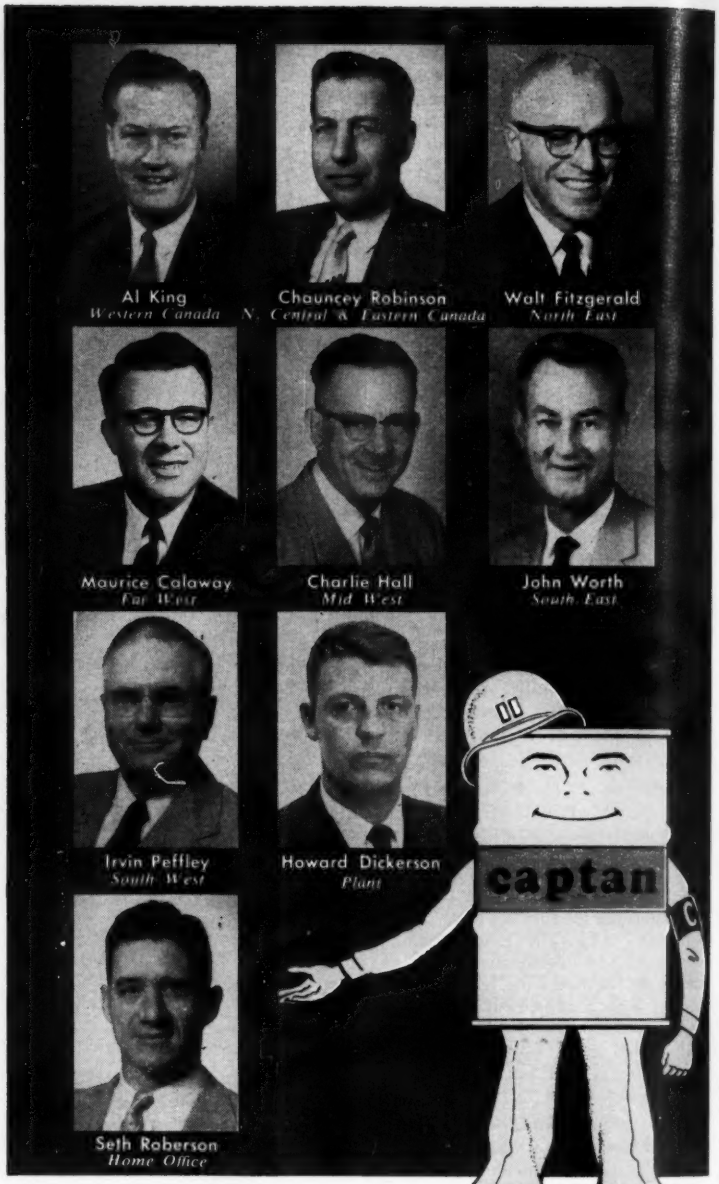

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P. O. BOX 15252 ★ HOUSTON 20, TEXAS

61-2

PRODUCT PARADE

Buried holiday detector . . .a handy, multi-purpose instrument to check coating in the ground and also find pipe quickly using the search coil . . . is described briefly in new literature. Consisting of a transmitter and receiver, units are equipped with output meters to give you both audible and visual signal to pin-point holiday precisely and eliminate costly, unnecessary digging. **14**

Air Compressor . . . Le Roi's latest model, a 125 cfm rotary portable unit . . . has increased horsepower and is designed to reduce service costs. Compressor is powered by a LeRoi wet sleeve engine whose larger displacement over former power unit provides 15% increase of hp. At 1600 rpm, this slow-turning engine reduces both engine and compressor parts wear. Portable unit has a spring loaded swivel towing eye that eases strain of towing during acceleration or when turning sharply. Both engine radiator and oil cooler are located at towbar end of compressor for protection against collision during transport or in the field. Unit weighs 2190 lb . . . still the lightest compressor in its class. **15**

Standard teletypewriters can now make direct inquiries to electronic computers—from great distances and at low costs—using a system devised by TELautograph Corp. New system utilizes standard components of Olivetti teletypewriter equipment for inquiry and reply linkage with an IBM RAMAC computer. In the computer center are two teletypewriter receivers—one, monitors incoming messages from distant points, the other monitors computer's answers to the remote inquiry stations. An automatic selector unit scans input stations, accepting messages alternately from each. The production prototype model has 5-inquiry stations, however, virtually any number of inquiry points could be established. Circuitry in the automatic selector unit makes it possible for a man to type an inquiry and leave his machine; the system will pick up the message when it can handle it and reply automatically. The two teletypewriter receivers type messages on hard copy and simultaneously prepare a standard 5-channel punched paper tape suitable for direct entry into the computer. **16**

"How do you know you've found the leak when you haven't even dug any holes?"

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the award winning

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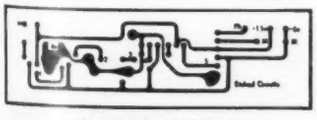
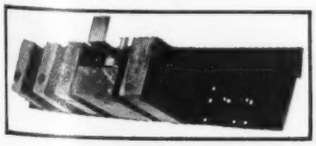
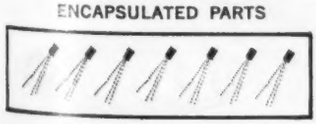


ETCHED CIRCUITRY



ENCAPSULATED PARTS



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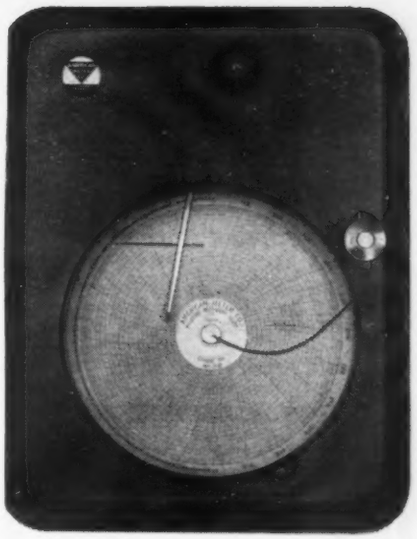

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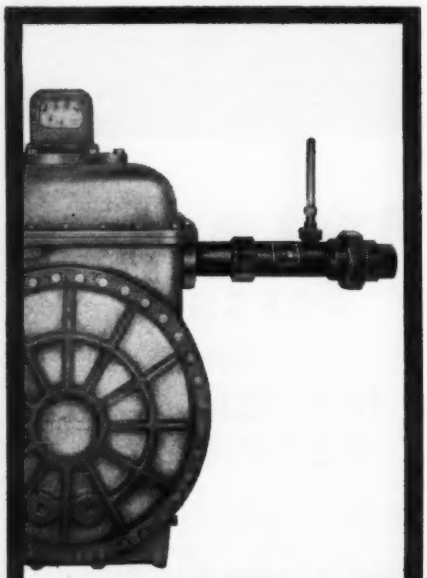

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INCORPORATED ESTABLISHED 1870

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New line of ball valves in combinations of metals, seats and seals to handle practically any gas, is available from Homestead Valve Manufacturing Co. Valves feature adjustable stem seal, a self-adjusting ball that seals with flow in either direction, and stem shoulder to prevent ball from being forced downward, line includes valves with Navy G bronze or semi-steel cast bodies; or brass, steel, and stainless steel bar stock bodies. Both the cast and bar stock types have full-round pipe-sized passage. Sizes range from ¼ to 2½-in. for pressures up to 400 lb and temperatures to 450 F. **17**

Latest addition to B-I-F Industries' line of telemetering instruments is new Chronoflo bellows actuated flow transmitter designed for pressure operated, explosion-proof remote flow metering service in gas distribution. Differential pressure unit contains no mercury and is capable of withstanding working pressures up to 1000 psig with standard construction. **18**

Two new bulletins . . . describing Reliance Type H pressure regulators and Reliance series Z pilot regulators . . . are available from American Meter Co. Bulletin 103 includes cutaway illustrations of 5 styles of Type H, each keyed to a dimension table. Bulletin 140 describes 8 types of Series Z pilot regulators. In addition to design features, both bulletins give pressure spring and valve orifice recommendations and capacities. **19**

Technical bulletin containing the latest data on gas odorants and their applications is available from Oronite Division

PRODUCT

of California Chemical Co. The 24-page report highlights a special section on odorization that covers such subjects as types of odorizers, storage and transfer of odorants, control of nuisance odors, soil adsorption, and the methods and equipment used in checking odor intensity. Also provides a concentrated report on desirable properties of odorants. **20**

Handy reference booklet . . . describing Cat-built pipe laying equipment from the little D4C tractor with pipelayer attachment to the big 583 tractor . . . has just been released by Caterpillar Tractor Co. The 8-page booklet shows action and model views of Caterpillar line of 5 pipelayers, gives brief specifications of each. **21**

Fiberglass reinforced nylon bushings . . . designed for use in cathodic protection . . . are available from ½ thru 2-in. sizes. Temperature changes and moisture pick-up pose no problem to operational efficiency. Bushing has excellent resistance to cold flow and has a molded hex head equal to a standard steel bushing. Black non-metallic color improves weathering characteristics. **22**

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WITH DOUBLE-ACTING

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For 5"—34" Flues

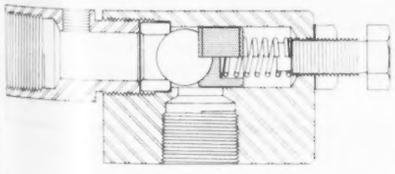
PARADE

International Harvester's new line of light-duty trucks . . . designated the C-line . . . features new low profile with overall height reductions of from 3 to 5 inches, longer wheel bases, and a choice of new suspension systems and frames. Models range from 4200 to 8800-lb gross vehicle weight. Pickup, panel, travelall and travelette models are offered as well as chassis with stake, platform, dump and service-utility bodies. Conventional 2-wheel and 4-wheel drive chassis are available. Travelette model *(shown in picture)* combines a 6-man cab with pickup body to provide a versatile passenger and cargo carrier. International V-8 engines are standard for all models. **23**

New manual designed to provide retail salesmen with a tested, step-by-step technique for demonstrating and closing sales of gas ranges equipped with Alltrol center simmer burners is now available from Harper-Wyman Co. Entitled, *How to Strike Gold Selling Gold Star Ranges,* the pocket-size 20-page booklet illustrates 5 simple steps to follow. Free on request. **24**

Calcinator Corporation's new line of automatic gas disposers for 1961 consists of three models, all incorporating a new ceramic lining in the secondary combustion chamber. New fire brick material is practically indestructible and is said to have proved extremely efficient; enhances operation of unit and adds to its service life. New line retains Calcinator "appliance look." **25**

Reznor Manufacturing Co. has developed improved dual blower systems for its blower type gas-fired unit heaters, and its modular duct furnaces. Instead of two ⅓-hp motors formerly used, new blower system utilizes a single ½-hp motor with blowers mounted on a common drive shaft. Single motor reduces hp requirement of system, simplifies its electrical wiring, and lowers operating and maintenance costs. Single drive shaft assures even inlet air flow, thus improving efficiency of blower systems. **26**



New valve to vent casing is available for pressures from 0 to 100 psi. The adjustable pop valve is designed to vent casing, yet retain any desired back pressure within the operating range. Valve has 1-in. inlet and outlet and a ¼-in. hole for the gage. **27**

First fully transistorized FM radio transmitter to operate on standard VHF 2-way mobile communications frequencies is now available from Motorola. New unit . . . called the "Handie-Talkie" pocket transmitter . . . is designed to operate on frequencies between 25-54 mc and 132-174 mc. It provides 500 milliwatts RF power output. Unit is completely self-contained, including microphone, antenna and batteries; weighs only 14.5 ozs and measures 5.5 inches by 2.5 inches. **28**

For backfilling . . . new bulldozer blade attachment called the Varidozer, offers almost unlimited range of hydraulically-controlled blade positions. Can be changed in seconds from straight blade to an angle blade, forward "V", reverse "V", tilt blade, or to any combination of these positions. Entire cycle of positions is controlled by 4 hydraulic levers mounted beside tractor seat. Secret to unit's versatility is sturdy vertical hinge in center of the blade that is controlled by 2 hydraulic push arms and 2 hydraulic tilt cylinders. Unit weighs about 6000 lb, is designed to be used on Caterpillar D6 tractors. **29**

Twelve position automatic valve . . . developed by Gelman Instrument Co. . . . can be used for automatic gas sampling and as an automatic sample feed for gas chromatographs. A three second electrical pulse is necessary to move valve from one position to the next. It takes a total of 10 seconds on standard model for valve to detent to a new position. New valve has 12 intake ports and 1 vacuum port, each tapped for ⅛-in. standard pipe and supplied with hose fittings installed. Valve body is made of corrosive resistant materials. **30**

X-Tru-Coat, new plastic-coated pipe, will soon be available from Hill Hubbell Co. Formal licensing arrangements have been completed with Republic Steel Corp., developers of this new technique in steel pipe protection. Hill Hubbell is the first specialist to offer both plastic and bituminous pipe protection. X-Tru-Coat is a continuous polyethylene plastic jacket extruded over a specially developed adhesive that bonds to the steel pipe. Bending or flexing the pipe, necessary in most installations, will not destroy the protective continuity of the coating because of the "live" adhesive. **31**

New process for fully automatic roll welding of pipe eliminates need for manual stringer bead or a backing ring. While the automatic submerged-arc welding process is presently employed in shops for double jointing line pipe, it is still necessary to use a backing ring — or weld the first pass with manual arc or tungsten inert-gas process. The new microwire welding system uses carbon dioxide as shielding gas, and has successfully butt welded pipe . . . laying the stringer bead automatically . . . without use of a backing ring. New system includes a wire feeder coupled to specially designed constant voltage motor generator welding welder. Filler wire is fed to a fixed welding torch for flat position or roll welding or to a hand torch for semi-automatic applications. New process differs from conventional CO_2 "Mig" methods in that an extremely small-diameter wire — usually from 0.200 in to 0.045 in. — electrode is used. Extremely low arc voltage, in range of 16 to 20 volts and low current from 30 to 150 amperes d-c are employed. **32**

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LOWEST COST SERVICE LINE TRENCH FOR
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Trench for gas service lines at lowest cost with the machine that gives extra traction and flotation . . . digs in any soil, even in frost or rocky conditions. The M-322 CR digs widths to 12", depths to 5'.

12 HP Crawler Model M-322 CR shown

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PRODUCT PARADE

New crawler mount for Hy-Hoe backhoe . . . offers highest flotation of any crawler backhoe available . . . only 3 psi using standard track pads. Manufacturer claims backhoe can work on any ground on which a man can walk. Unit is powered by 70-hp, 6-cylinder gasoline engine, has 360-deg swing, ½-yd struck capacity, digging depth of 15 ft, a reach of 23 ft, and dump height of 12 ft 6 in. Unit can climb grades of 30%; has top speed of 1.5 mph. Track length is 10 ft; overall width only 8 ft conforming to local, state and federal highway requirements so unit can be transported without special permit. **33**

Instructions for lubricating and servicing Rockwell-Nordstrom valves are given in new 8-page bulletin from Rockwell Manufacturing Co. Chart of recommended lubricants, and photos and description of lubricant dispensing equipment are also included. **34**

New line of service bodies . . . for ½, ¾, and 1-ton pickup truck chassis . . . is available from Utility Division of Highway Trailer Industries, Inc. New general service body line is designed for universal application in utility construction and maintenance; units are available for all popular makes of trucks including those with dual rear tires. Inside floor space is 48.5 inches wide with lengths of 75 to 104 inches depending on chassis. Overall width is 77.5 inches; height, 42 inches and 29 inches from floor to top. Side boxes are 14.5 inches deep. **35**

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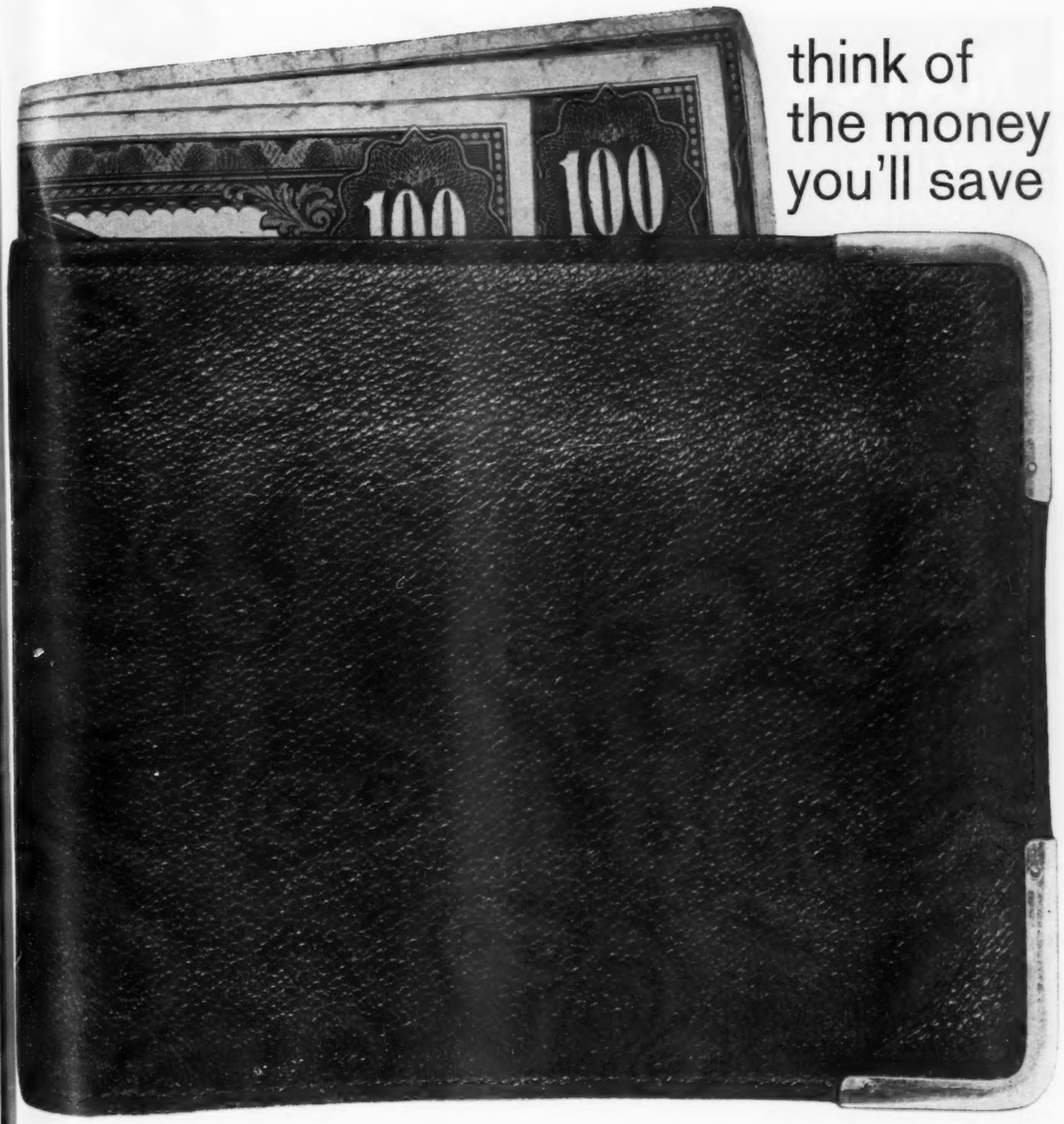

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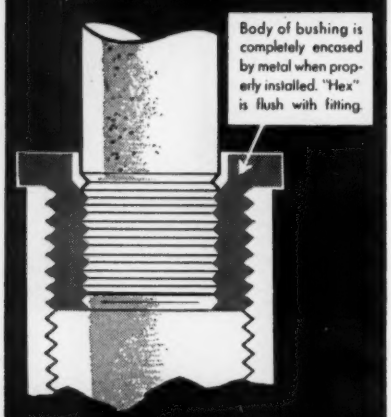

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■ Sandwiched between two dissimilar metals, Mayco nylon dielectric bushings prevent metal to metal contact – stop *electrolytic* action!

Able to withstand pressures in excess of 1000 lbs. and temperatures over 300°F, Mayco dielectric bushings gain added strength from clamping action of surrounding metal.

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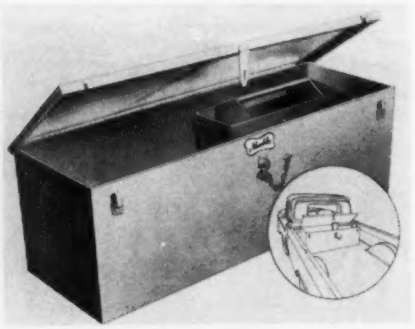
PRODUCT PARADE



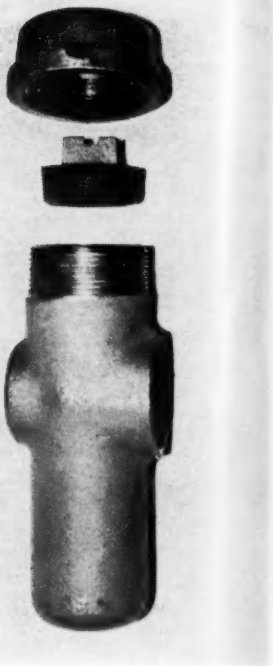
Weather-tight, pilfer-proof all steel tool and equipment chest . . . designed to meet special needs of maintenance and construction men working out of pick-up trucks . . . is available from Muckle Manufacturing Co. Chest also serves for general purpose carrying and protected storage of tools and equipment being moved from job to job. Overall dimensions are 18 by 18 by 55 inches; total weight empty is 112 lb. **36**

Hanger for banks of pipe uses spring alloy aluminum clamps and a slotted channel iron to provide immediate, automatic, and permanent pipe alignment even though workmen step on pipe. The one piece clamps slide over the pipe, catch in the slots and hold the pipe securely against the channel iron. Clamps are small in bulk, nest together for easy handling, and are available in wide variety of sizes. **37**

Details on Reliance type CBVA 400 and 600 pressure regulators for reducing and boiler fuel applications are given in new bulletin from American Meter Co. Both regulators are for use on distribution, transmission, and industrial systems where reliability and minimum maintenance, and advantages of underspring loading are required. **38**

Rockwell "1001" regulators are described in newly revised 12-page bulletin. "1001" regulators provide control for installations where supply pressures range up to 200 psi and must be reduced to 60 psi or less. Typical applications include industrial burner controls, small town border stations, district pressure controls, and small distribution systems. **39**

"Don't you realize it's standard practice to make crossings UNDER the highway?"



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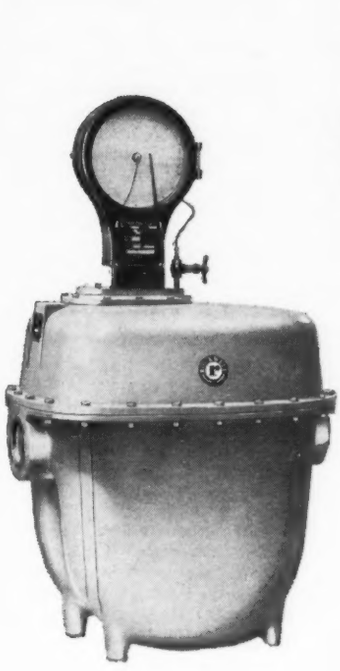
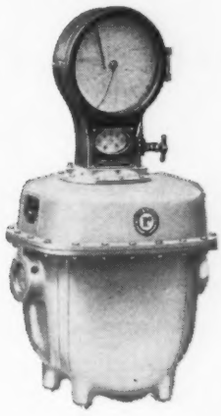


No. 10,000
(with Emcorector)

No. 5000



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No. 1600

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- FIELD PROCESSING
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Rockwell alone can fit all your service needs from the **only** complete line of aluminum meters. These meters are numbered according to capacity ratings. Ratings ranging from 1600 to 10,000 cfh at 4 oz. inlet can be increased substantially by measuring gas at higher pressures—up to 100 psi. Corrections to base pressure are then made with either Emcorectors or Combined Record Gauges.

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Bookshelf

1961 Registry of Industrial Radio Systems, *edited by Ethel V. Sleeper. Published by Communication Engineering Book Co., Monterey, Massachusetts. Pages, 243. Price, $5.*

The 16th annual edition reflects the amazing expansion of mobile radio use in the industrial service category. Completely revised from FCC records, the Registry covers all mobile, fixed, and relay transmitters operated by special industrial, petroleum and pipeline, power utility, forest products, relay press, motion picture, and VHF maritime organizations. Each licensee is listed by location and name in Part 1 together with addresses of control points, frequencies, number of mobile units authorized, and make of equipment used. Part 2 lists systems operating on each of the frequencies assigned by FCC for use by industrial services.

Your Government Guidebook *by Robley D. Stevens. Published by W. A. Wilde Company, 10 Huron Drive, Natick, Massachusetts. Price, $4.50.*

Guidebook gives interesting and pictorial account of the National government in Washington, D. C. and its buildings and places of special interest. Of aid to know and understand the functions of the government.

Fuel Cells: Power For the Future, *written by nine graduate students at the Harvard Business School. Published by Fuel Cell Research Associates, P. O. Box 157, Cambridge 38, Massachusetts. Pages, 160. Price, $18.75.*

An economic and technical analysis of the developments and opportunities in the field of electrochemical fuel cells, the book also presents a rigorous analysis of several fuel cells being considered for commercial application, along with analyses of predicted near-term and long-range fuel cell developments. Presently, most practical cell, according to the report, is Union Carbide's hydrogen-oxygen fuel cells. Companies whose fuel cell work is analyzed and discussed in the report include Electric Storage Battery, General Electric, Monsanto, Esso, Allis-Chalmers and others. The authors indicate, with extensive supporting data, that in this decade fuel cells will find widespread application in powered fork lift trucks, city delivery trucks, heavy construction equipment, tugboats, ferries, taxicabs, and perhaps automobiles and locomotives.

Gas Shielded-Arc Welding. *Published by The American Welding Society, 33 West 39th Street, New York 18, New York. Pages, 78. Price, $1.50.*

First AWS book on gas shielded-arc welding processes, the book describes in detail the group of processes originally known under the name of inert-gas processes. Development of shielding gases, such as CO_2, which are not inert, caused the change of name. Contents are taken from published and unpublished material from Sections I, II, and III of the Welding Handbook, and include in one small authoritative book information on gas shielded tungsten-arc welding, gas shielded metal-arc welding (including CO_2 welding), cutting, gases, equipment, and cost data. Profusely illustrated with photographs, schematic diagrams, and charts.

Cost Engineering in the Process Industries, *edited by Cecil Chilton, Editor of Chemical Engineering. Published by McGraw-Hill Book Company, 330 West 42nd Street, New York 36, New York. Pages, 502. Price, $11.00.*

Although written for the process industries, the facts and data compiled in this book have application for gas distribution engineers who are called on to make economical cost and profit-ability analyses — specifically in "peak shaving" plants. Book discusses accepted methods, specific data, and essential principles useful in making estimates of plant, equipment, and operating costs, and in predicting required capital investment. Of special interest are the cost indexes.

Simplified Fr-Y Factors, *by John P. Squier. Published by John P. Squier Co., Gas Measurement-Engineering Service, Box 6100, Dallas 22, Texas. Pages, 78. Price, $25.*

As you would guess from the title this book contains a complete set of simplified combined Reynolds Number and Expansion Factors compiled from basic A.G.A. formulae to save time and labor in gas measurement calculations. Tables are especially adaptable to installations where pressures or differentials vary from day to day, and for operators who incorporate such factors in hourly meter coefficient.

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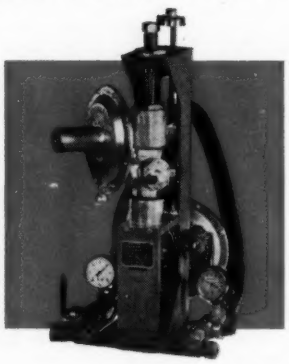

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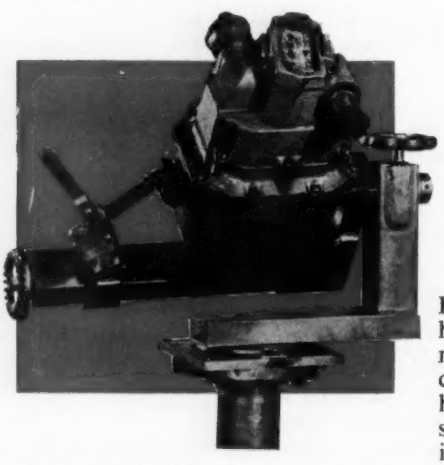

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differential. Range of pipe sizes is from 1.68 to 29.25 ID; pressures range from 20.0 vacuum to 5000 psig, and the differential range is from 0 to 100.0 in. water. In order to condense the information, the tables are based on upstream static connections for pipe taps, and downstream static connections for flange taps. Under test, the tables show accuracy to within plus or minus 0.1 of 1.0% maximum of the tables published by AGA Gas Measurement Committee Report No. 3.

A.G.A. Laboratories Research Bulletin No. 85, "High Speed Oven Design and Baking Studies, Part II: The Celeriter Oven" *Written by D. M. Spinell. Published by American Gas Association, 420 Lexington Avenue, New York 17, New York. Pages, 46. Price, $2.*

Design and performance of the experimental "Celeriter" deck oven is described in the second and final publication resulting from Industrial and Commercial Gas Research Project, *"Determination and Control of Proper Oven Environment for Baked Foods."* Experimental work with the prototype oven was used to evaluate and demonstrate the practicality of using both forced convection and radiation heat from gas burners for faster quality baking. Quality baked goods were produced in the Celeriter Oven in about half the time needed with conventional gas deck ovens.

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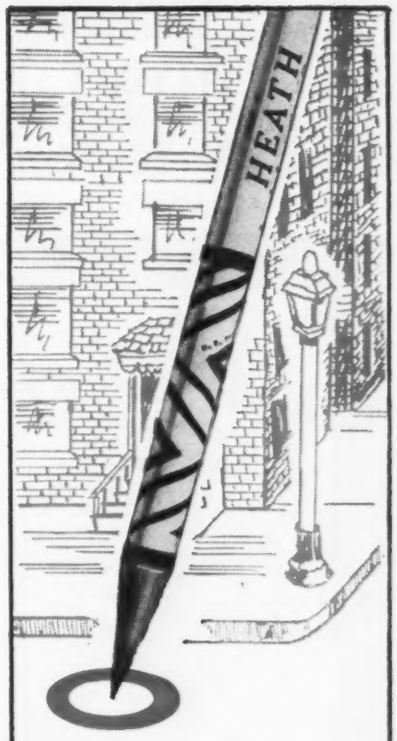

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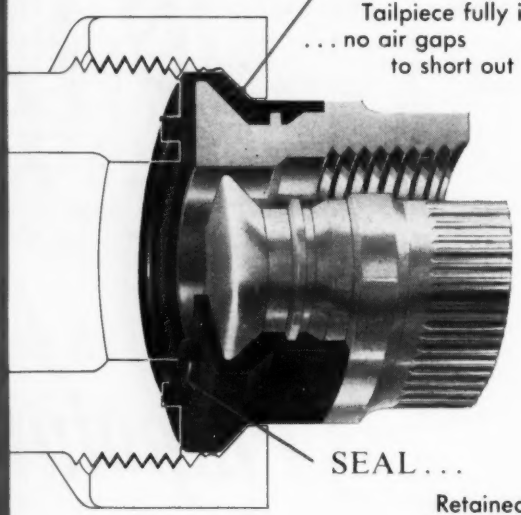

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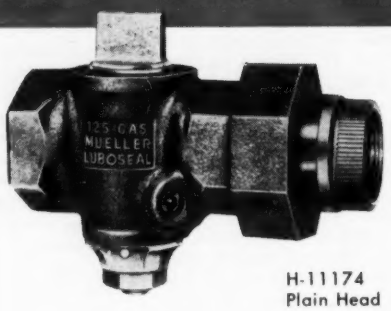
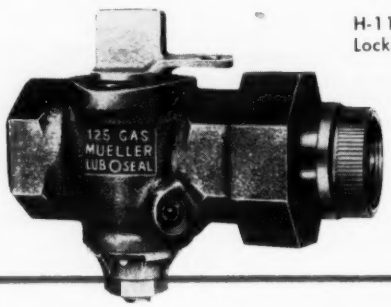


H-11174
Plain Head

H-11179
Lock Wing



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Straight way, solid head
Tamperproof

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Finish: Black
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Sizes: ¾", 1", 1¼"

A full line of 125 pound gas meter stops

H-11170
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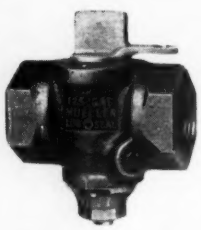
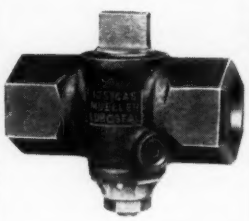
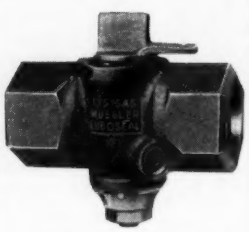


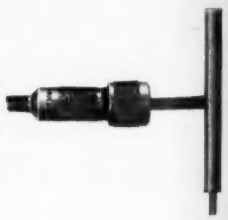
H-11175
Lock Wing
Sizes: ¾", 1", 1¼", 1½", 2", 2½"



H-11173
Plain Head
Recessed Ends
Sizes: ¾", 1", 1¼", 1½", 2"



H-11178
Lock Wing
Recessed Ends
Sizes: ¾", 1", 1¼", 1½", 2"



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